

OCT 9 1943

AUTOMOTIVE *and Aviation* INDUSTRIES

OCTOBER 1, 1943

How to stop a war... *like that!*

FRICITION can stop anything
Even a war.
Especially *this* war, mechanized as it is to an
almost incredible degree.

Take away a certain anti-friction device—
and the greatest war machine we have ever faced
would soon grind to a *permanent* stop.

Take away anti-friction bearings—and not only
the *tools* of war, but the machines which *make*
these tools of war would shortly become
so much scrap.

UNFORTUNATELY, we are *not yet* able to do this.
But in the field of anti-friction bearings—as in other fields
—we are steadily *out-producing* our enemies.

Before bombs dropped at Pearl Harbor.
NEW DEPARTURE was the world's largest producer
of ball bearings . . . now it has a major
responsibility in the ball bearing war program.

NEW DEPARTURE - DIVISION OF GENERAL MOTORS - BRISTOL, CONNECTICUT

3200



New Departure
THE FORGED STEEL BEARING



Back the attack
with War Bonds

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

OCTOBER, 1943

How Illinois shop doubled threading speed on 5-inch forged steel plugs. A shop in central Illinois wanted to step up its output of 5-inch forged steel plugs for a high-pressure oxygen tank. Operations were outside threading of the plug and inside tapping of two 1-inch holes. At a spindle speed of 50 r.p.m., using a geometric die head, trouble was experienced chasing a suitable thread on the outside of the plug. By changing from sulfurized oil to Stanicool H.D., mixed one to five with water, and raising spindle speed to 100 r.p.m., the rate of production was doubled with satisfactory threads even at the higher speed.

Lengthened tool life 75%. Since adopting Premier Cutting Oil No. 150 for all operations in making muzzles for 30 caliber machine guns from 1020 steel, a shop in southern Wisconsin reports that tool life was increased 75%, and better visibility of operations was secured. Premier is a highly sulfurized, transparent oil.



Having rejection headaches? Perhaps this experience of an Iowa shop may be helpful. A spade tool was used to finish the cavity in 75 mm. explosive projectiles (4150 steel) on lathes. The headaches encountered on this job included excessive chatter, poor finish, and frequent tool changes, with the many cutting oils that were tried. When Stanicut 155 CS was used, chatter stopped and workmanship was readily approved by army inspectors. Then, too, this more efficient cutting

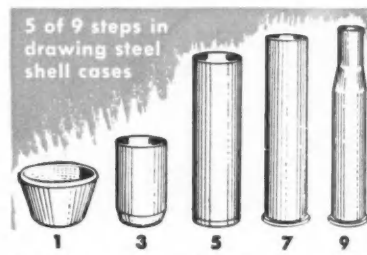
oil stepped up tool life to eight to ten hours, thus making tool changes necessary only at the end of a shift.

Three tips on better tapping jobs. A big automotive plant in Michigan reports that Stanicut 155 CS was the complete answer to three tapping problems: 1. Stanicut cleared up trouble in getting proper finish on Nickel-Molybdenum steel in a nut tapper. Stanicut gave better thread, lower oil consumption, 80% longer tap life; 2. On thread rollers, using the same steel, improved cooling was noted and die life was extended considerably; 3. On a tapper, there was trouble with thread tearing and short die life in tapping a 2¾ inch packing nut (same steel). Stanicut 155 CS helped produce a perfect thread and made tools last longer.

As the going gets tougher . . . No doubt your plant by this time is meeting or beating original production quotas. The "shake-down" period is over. But that only means that further increases in production are going to be more difficult to make. It will be harder to find places to cut corners—for example, to step up production on machines already crowded to capacity.

That's one place a Standard Cutting Oil Specialist can help you. A better cutting oil may reduce time-taking tool changes, permit increased machine speeds, or produce better finishes—all contributing to more work with the least amount of change in your present production setup. Write or phone the nearest Standard Oil Company (Indiana) office, or 910 S. Michigan Avenue, Chicago 5, Ill., for the Engineer nearest you. In Nebraska, call any Standard Oil Company of Nebraska office.

Machining time on rack cut in half. An Indianapolis plant had trouble machining a rack without tearing or scratching the metal. This stainless steel rack had 65 teeth, .040 inch deep, of 64 pitch and 1/4 inch face. Good results with ordinary oils were obtained only when the machine worked at slowest feed. Better results were obtained when carbon tetrachloride was added, but it made the operators sick. Stanicut 309 BCS was tried. Reports show it gave excellent results at faster speeds, cut the machining time in half, and had no ill effects on operators.



Sticking licked in making 37 mm. steel shell cases. A manufacturer in Illinois reports that the cooperation of Standard Cutting Oil Specialists helped him lick a number of production problems in connection with making 37 mm. shell cases from SAE 1025 steel. On the first draw, for example, the use of Stanicool H.D., four or five to one, solved the problem of loading of dies and scratching. The same oil also prevented sticking in the heading operation.

How burrs were banished in stamping gears. The problems of a St. Louis shop were how to avoid burrs, get a straight wall, and get close pitch diameter in one operation stamping steel instrument gears. The complete answer was found in Stancut 126 BCS. It helped assure clean, straight walls—pitch diameter true to .001 in.—long die life.

TOOLS ARE WEAPONS..TREAT THEM RIGHT

STANDARD OIL COMPANY (INDIANA)

**STANDARD
SERVICE**

★ LUBRICATION ENGINEERING

Vol. _____

J. R.
JERO
MARO
L. W.
R. R.

I
I
I
H
H
U
H
C
H
C
N
D
N
N
N
C
A

JULIA
N
C
F
20
in
F
A
Cable

AUTO
(month
(month
the Ho

JOS. S.
EVER
WILLI
JULIA
P. M.
Octob
AUTOM
October
price:

AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly
October 1, 1943
Vol. 89
Number 7

JULIAN CHASE, Directing Editor
J. R. CUSTER, Associate Editor
JEROME H. FARRIS, Ass't Editor
MARCUS AINSWORTH, Statistician
L. W. MOFFETT, Washington News Ed.
R. RAYMOND KAY, West Coast
JOS. GESCHELIN, Detroit Editor
E. L. WARNER, JR., Associate Editor
H. H. ROBERTS, Ass't Editor
HOWARD KOHLBRENNER, Art Editor
J. DONALD BROWNE, Washington News Ed.
MARCUS W. BOURDON, British

CONTENTS

Renegotiation and the Machine Tool Industry. By A. G. Bryant	17
Employee Counseling in Human Engineering. By A. C. Gilbraith	19
Lord Plant Organized Efficiently to Make Wide Variety of Rubber Mountings for Vibration Control. By Joseph Geschelin	20
Flow of Typical Aircraft Brass Mill Orders	25
Forging an 84 lb. Connecting Rod for Diesel Engine	26
Use of Glow Plugs for Cold Starting Diesel Engines	28
Russian Lagg-3 Fighter	30
Cyclewelding Applied Successfully to Airplane Subassemblies	33
Heat Treating Problems in Aviation. By Max E. Tatman	34
Castings Poured on Mechanized Conveyor at Chevrolet Magnesium Foundry. By Joseph Geschelin	36
New Products for Aircraft	39
Design for Production. By J. S. Haldeman	40
New Production Equipment	42
New Products	44
News of the Industry	46
Calendar of Coming Events	52
Advertisers' Index	188

Automotive Division

JOS. S. HILDRETH, President and Manager

JULIAN CHASE, Vice Pres. G. C. BUZBY, Vice Pres.

OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone Sherwood 1424
New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600;
Chicago 1, Ill., Room 916 London Guarantee & Accident Building, Phone Franklin 1235; Detroit 2, Mich., 1015 Stephenson Bldg., Phone Madison 2090; Cleveland 14, Ohio, 609 Guardian Bldg., Phone Cherry 4188; Washington 4, D. C., 1061 National Press Bldg., Phone District 6877; San Francisco 5, Calif., 605 Market St., Room 708, Phone Douglas 0987; Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone Lafayette 5525.
Cable Address: Autoland. Philadelphia

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

AUTOMOTIVE and AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices

Chestnut and 56th Streets, Philadelphia 39, Pa., U. S. A.

Officers and Directors

C. A. MUSSELMAN, President

Vice-Presidents

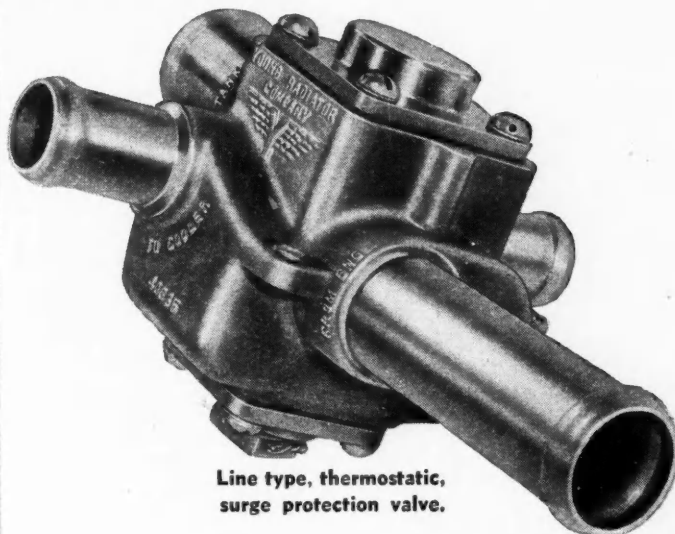
JOS. S. HILDRETH
EVERETT R. TERHUNE
WILLIAM A. BARBER, Treasurer
JULIAN CHASE
P. M. FAURENDORF
GEORGE H. GRIFFITHS
J. H. VAN DEVENTER
JOHN BLAIR MOFFETT, Secretary
THOMAS L. KANE
HARRY V. DUFFY
C. S. BAUR
G. C. BUZBY
CHARLES J. HEALE

October 1, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

AUTOMOTIVE and AVIATION INDUSTRIES. Vol. 89, No. 7, Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign \$2.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15, 1943), 50 cents.

Young Presents NEW OIL LINE SURGE VALVE



Line type, thermostatic,
surge protection valve.

Sudden surges of congealed oil developed by scavenging pumps during cold starts often cause cooler failures. By-passing oil around coolers during these periods gives needed surge protection. Young engineers have now completed the first thermostatic, line-type, surge protection valve with provision for relief from rapid acceleration pressures. It gives a new kind of cooler protection and was designed for systems not incorporating surge protection in the cooler valve.

Normally open, the new valve permits the pumping of congealed oil directly from engine to supply tank. As oil warms, the by-pass closes and the cooler inlet opens . . . warming oil is directed through the cooler jacket bringing the core into operating condition. You are invited to write, give your performance requirements and get full information about Young's new oil line surge valve and how it fits your needs.

YOUNG RADIATOR CO., Dept. 213-K Racine, Wis., U. S. A.

Distributors

Pacific Airmotive, Burbank, California

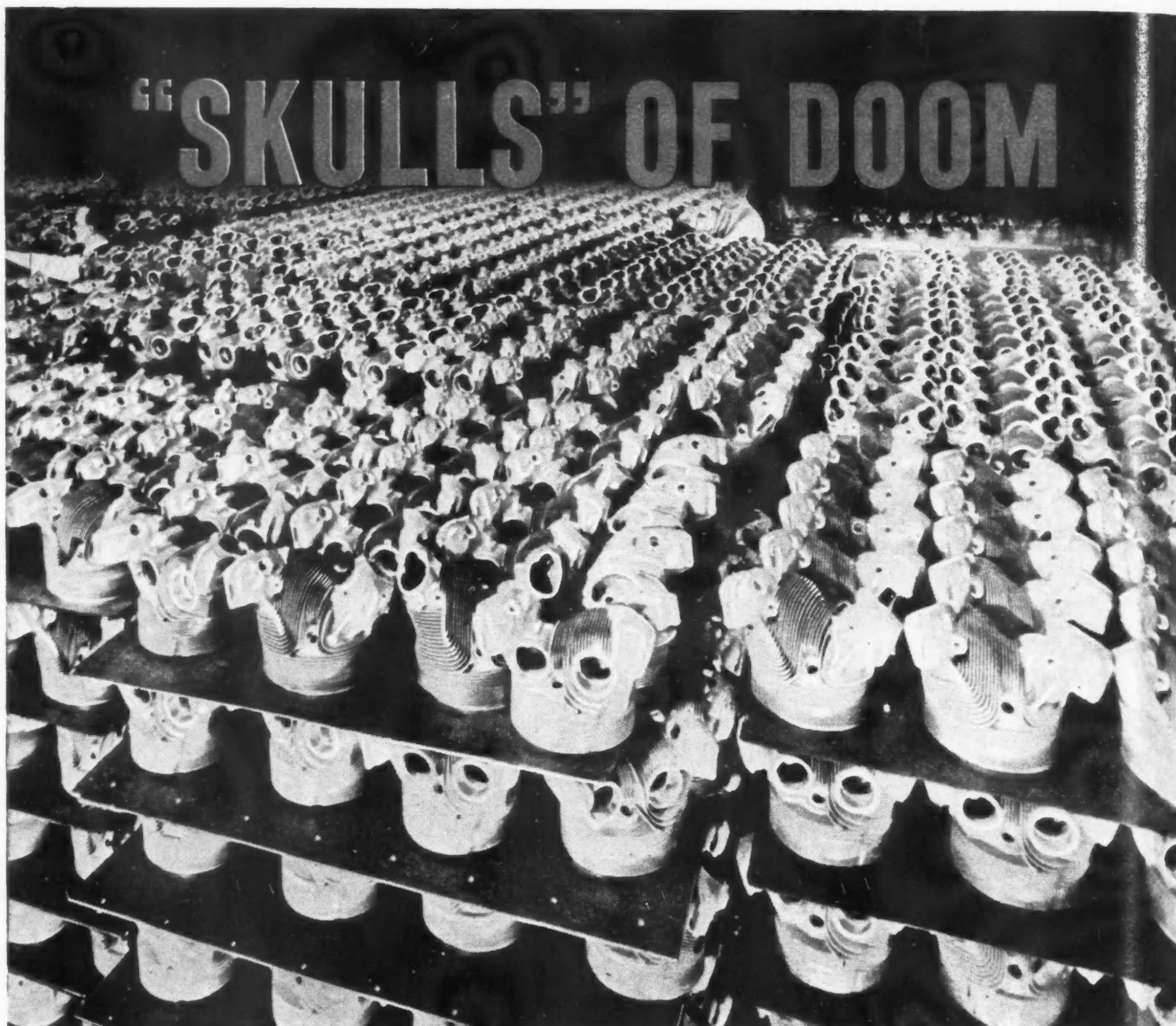
Aircraft Steel and Supply Co., Wichita, Kansas

Buy Bonds — Produce More — Salvage Scrap — Win the War

YOUNG

HEAT TRANSFER PRODUCTS

Oil Coolers - Gas, Gasoline, Diesel Engine Cooling Radiators - Intercoolers - Heat Exchangers - Engine Jacket Water Coolers - Unit Heaters - Convectors - Condensers - Evaporators - Air Conditioning Units - Heating Coils - Cooling Coils



STACKED row upon row and looking like skulls foretelling the doom of all United Nations' enemies, these aircraft cylinder heads await assembly into engines for powering war planes.

In the mass production not only of airplane engines, but of countless other munitions now in such demand, war plants everywhere are getting higher output and longer life from their cutting tools through the use of *Texaco Cutting and Soluble Oils*.

Texaco Cutting Oils lubricate the tools, carry away the heat, prevent chip welding. Their use assures improved surface finish

and maximum output per tool grind.

So effective have Texaco Products proved that they are definitely preferred in many important fields, a few of which are listed at the right.

A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the correct grades of *Sultex*, *Transultex*, *Cleartex*, *Britex*, *Almag* or *Soluble Oils* for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

- ★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.
- ★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.
- ★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
- ★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.
- ★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.



TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS

FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



IN THIS ISSUE

AUTOMOTIVE and AVIATION INDUSTRIES

Volume 89 October 1, 1943 No. 7

AUTOMOTIVE INDUSTRIES

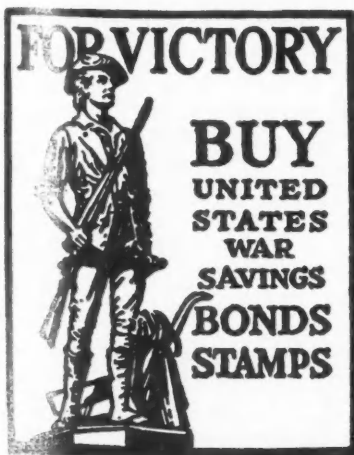
Reg. U. S. Pat. Off.

New Planes for Navy

Two new U. S. Navy planes, the Grumman F-6-F Hellcat and the Seawolf, made by Consolidated Vultee, have been introduced in recent weeks. The Hellcat is a single-place fighter plane, successor to the Grumman Wildcat but more heavily armed and with improved protective armor. It is equipped with a new flexible gasoline tank, a more advanced type than previous leak-proof tanks, functioning on the principle of a rubber bag inside a canvas hammock. It also is faster and has a higher ceiling than the Hellcat and is powered by a Pratt & Whitney engine. Production has been under way for more than six months at Grumman Aircraft Engineering Corp., Bethpage, L. I.

The Seawolf is a 16,000-pound torpedo bomber carrying three men, a pilot, gunner and radio man-bombardier. It is powerfully armed, well armored and can carry either torpedo or bombs.

"There is no other torpedo plane in the world to match it," said Rear Admiral Ralph Davison, assistant chief of the Navy's Bureau of Aeronautics, at dedication ceremonies of the new Convair Airport, adjacent to the Consolidated Vultee Aircraft Corp. plant, formerly a Mack Mfg. Corp. truck plant, at Allentown, Pa.



Renegotiation and the Machine Tool Industry

17

Congress set up the renegotiation process as a supplementary means of siphoning off that part of the contractors profits that were obviously out of line. The reactions of this procedure on the future of the machine tool makers can well cripple the industry. Read this article. It is revealing.

Human Engineering

19

Here is the account of a new and increasingly vital phase of industrial relations conceived at the Douglas Aircraft plant.

Forging an 84 lb. Connecting Rod

26

Pictorially and in text the steps are shown just how these large connecting rods for Diesels are made.

Use of Glow Plugs in Cold Starting Diesels

28

This article by A. F. Klingner of the Edison-Splitdorf Co. explains another means to an end. It really is a follow-up of the articles by P. M. Heldt in the two May issues of *AUTOMOTIVE and AVIATION INDUSTRIES*. Read it.

Russian Lagg-3 Fighter

30

Here is a most complete description of a Russian warplane. Sketches, specifications and text round out an account of its features.

Heat Treating in Aviation Production

34

The one big problem in this field is to increase the weight-strength ratio. The author of this article goes into much detail to explain what is being accomplished and how the results are being arrived at.

Castings poured on Mechanized Conveyor

36

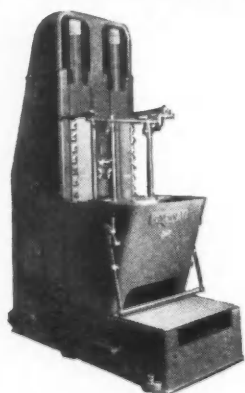
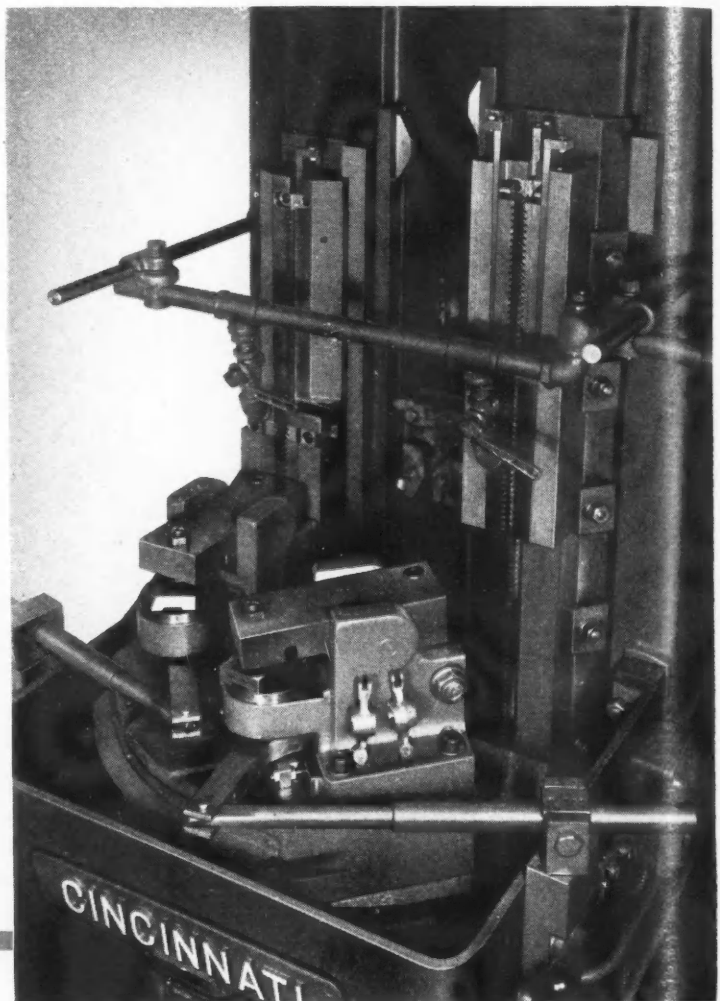
At the Chevrolet magnesium foundry there is a technique that is of unusual interest. Read this article.

RIGHT HAND RAM DOES DOUBLE DUTY In Broaching Aircraft Parts

One of the problems to overcome in broaching a deep slot is the natural tendency of thin adjacent walls to "spring", playing havoc with the inherent accuracy of the broaching process. Should the outside surface of the walls of the fork created by the slotting operation also require machining, the possibility of inaccuracy practically doubles.

Two examples of this type—intake and exhaust rocker arms for aircraft engines—are being successfully broached by the equipment illustrated at the right: a CINCINNATI No. 3-48 Duplex Hydro-Broach Machine with CINCINNATI engineered fixtures and broach inserts. In the left-hand fixture, the slot is broached half way to depth and the outer sides of the clevis are rough broached. This operation conditions the part for accuracy. Transferring the part to the right-hand fixture, the operation is completed. Here the ram does double duty in finishing broaching the slot and sides, while maintaining close accuracy because of ingenious "sizing" or "rubbing" blocks which prevent the walls from deflecting under cut.

This job was tooled up by CINCINNATI Service Engineers, who will be glad to analyze your surface finishing problems and to recommend equipment for more economical production . . . longer tool life . . . more precise accuracy. Just send a blue print of the part with requirements.



CINCINNATI No. 5-42 Duplex Vertical Hydro-Broach Machine. Complete specifications of the Duplex line may be obtained by writing for catalog No. M-894-2.



THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

AUTOMOTIVE and AVIATION INDUSTRIES

Published on the 1st
and 15th of the month

Vol. 89, No. 7
October 1, 1943

Renegotiation and the Machine Tool Industry

By A. G. Bryant

Chairman, N.M.T.B.A. Committee on Renegotiation
and Vice-President, Cleereman Machine Co.

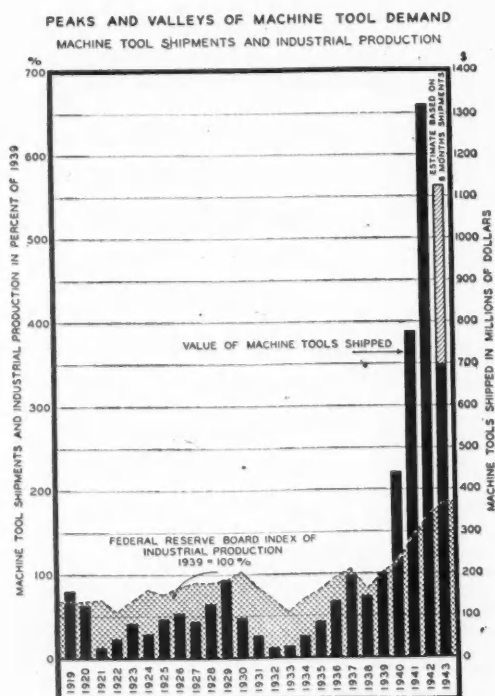
THE machine tool industry, small by comparison with many of America's industries, consists of some 300 companies which in pre-war years seldom had a combined annual output valued as high as \$200 millions. The curve of machine tool output is a story of sharp, high peaks and broad, low valleys, as illustrated on the accompanying chart by the comparison to the trend of industrial production in general. Obviously in an industry of this character, reserves must be set aside during the "peak" years to carry through the "valley" years.

Long before hostilities were forced upon this country, American machine tool builders were called upon by the metal working industries of Great Britain, France and Russia, to help retool those countries for defense. Over a third of the output of American machine tools in 1936, 1937 and 1938 was shipped abroad for the rearmament programs of those countries. Two-thirds of these exported machines went to England alone. By the middle of 1939 our machine tool builders, of their own volition and with their own money, had already expanded their plants and were training thousands of new men to supply the needs of the United Nations. The industry had by Jan. 1, 1942, invested all of its earnings of the preceding five years—and more—in expanding plants and facilities. Machine tool output was stepped up from \$200 mil-

lions in 1939 to \$400 millions in 1940, \$775 millions in 1941 and \$1,320 millions in 1942. The peak of orders placed with the industry was reached in March, 1942. The peak of production was passed in January, 1943. Beginning in February, 1943, output declined gradually and by mid-summer new machine tool orders ran less than a quarter of the volume the industry was required to build in the preceding year.

In short, the industry's war job, as concerns the building of machine tools, is almost finished as this is being written, and the industry is even today headed for another of its traditional valleys. The machine tool industry is not greatly concerned about its situation during the remaining period of the war, for already its plants, equipment and skills are being partially turned to production of direct war equipment. The great dilemma of the machine tool industry arises when war production ceases.

Stated another way—in the 10 years preceding 1939 the average annual output of the industry was about 25,000 machine tools. By contrast, in the three years ending in 1943, machine tool builders will have produced about 700,000 machines. Over 85 per cent of these machine tools, produced for the war, are of the same type as the machine tools in everyday peacetime use, and some of them are already being diverted from war work to the production of non-war goods. Because of improvements in design and materials, these machine tools, regardless of strenuous



Taxation by Men

"Our tax laws specify certain percentages of earnings which must be returned to the Government. But under renegotiation, the additional amount of earnings which must be returned to the Government is purely and solely a matter of the judgment of the Price Adjustment Boards. In short, renegotiation becomes a matter of taxation by men rather than taxation by law.

The situation is, to say the least, new in the annals of American taxation procedure. Heretofore taxation has been governed by rules. Now the judgments of men supersede the rules, and we have groups of people who have become a taxing authority over and above the Internal Revenue Department—men who hold in their hands, and can dispose of as they will, the postwar destinies of American industry."—NMTBA

use during the past three years, will be capable of operation for at least 15 years longer. Even if our domestic economy should be maintained at top levels during postwar years, and we hope it will, there are now more machine tools standing ready and available in America than could conceivably be needed to turn out all of the products required for peacetime purposes for a long time to come.

There is talk in some quarters of possible export markets that might absorb a share of the postwar American supply of machine tools. In this connection it must be borne in mind that for war purposes England, Germany and Russia have during this war likewise been building fantastic quantities of machine tools. South America and the Far East are limited markets at best. There would seem little prospect that exports will have any major effect on the postwar machine tool situation in the United States.

Eventually machine tool builders, as they have done in the past under similar circumstances, will engage in research and development, redesign machines, introduce new models, and slowly regain markets. But this takes time, and above all it takes money—money to finance research and development, money to pay workmen, money for building, testing and selling new models. The engineers and mechanics that the industry has developed are the very foundation for these developments. Once lost, they can be replaced only with difficulty, and after long training. It is money for these purposes which machine tool builders are striving to retain out of the earnings of their war production period; and herein lies the crux of their inability to agree with the findings of the Price Adjustment Boards.

It is the contention of the machine tool industry that machine tool builders who have, during the war, sup-

The Suggested Remedy

Immediate Congressional action on an amendment to the renegotiation law is urged by the machine tool industry, which suggests the following principles as the basis for the amendment:

1. Renegotiation on the basis of "profits before taxes" should be abandoned. Agreements should be made wholly in the light of "profits after taxes."

2. The extent to which a company's product is expendable in the war effort should be taken into consideration in determining the amount of the company's earnings to be recovered by the Government through renegotiation.

3. Companies which have saturated their postwar markets by reason of their wartime production should be permitted to retain out of their earnings the reserves necessary to maintain their service . . . in the postwar period.

plied their market at least ten years in advance, should be permitted to retain a larger share of their earnings than need be retained by companies whose postwar markets are by contrast building up toward new highs all through the war period.

Original Purpose of Renegotiation

It seems clear that Congress set up the machinery of renegotiation for the particular purpose of recovering a larger share of "windfall" profits than would be recovered by taxes alone. A typical instance is that of a war product on which there had been little or no production experience. Lacking knowledge of costs, the price was set high enough to allow for contingencies. With production experience and volume far larger than anticipated, costs proved to be far below estimates and earnings were correspondingly greater. The tax laws, operating upon a fixed percentage basis, do not provide adequate correction for such circumstances. Renegotiation was set up as a supplementary means of siphoning off that part of the earnings which obviously were out of line.

We doubt seriously whether renegotiation should

(Turn to page 70, please)

Human Engineering

A NEW and increasingly vital phase of industrial relations began for Douglas Aircraft Co. with one man—Donald Douglas, its president. As the firm in recent years grew in number of employees as well as in importance, he remembered fondly his early days in a small business when he had a total payroll of just a few hundred. At that time he could enjoy the friendship and confidence of every man in the shop, and it was one of his confirmed habits to daily, if possible, contact almost every man in the organization to not only maintain and stimulate the relationship that had prevailed, but to get any ideas each individual employe may have about improving not only the product, but perhaps equally as important, the conditions under which the product was manufactured, such as the lighting, heating, ventilation, hours, working conditions and wages that meant so much to the individual. That personal interest continued and increased throughout the years until the expansion became so rapid and so great that it was physically impossible to keep up the contacts.

With an organization of its present dimensions, and the individual touch being out of the question, the nearest approach to it was a counseling system that would represent the President to each employe and would in turn give each employe an entré to him through the counselor. Counseling as such is the new born babe of the industrial relations family. It has not been generally accepted by industry, and at this time has no great background of experience on which anyone can formulate successful procedures. It had its origin in the research laboratories of the Western Electric Co., and particularly in its Hawthorne plant outside the city of Chicago.

Through a Professor Mayo of Harvard, an Australian from Sydney, New South Wales, who had accomplished through a special type of interviewing some phenomenal results in the rehabilitation of shell-shocked soldiers from the first World War, a series of experiments were initiated that were designed to last over a period of many years with the idea of determining four basic areas of significant data in interviews with each employe:

1. The past conditioning of the individual.
2. The individual's present situation.
3. The individual's basic demands which are derived from his past conditioning—the demands he is bringing to and making of his present situation.
4. The demands the present situation is making of him.

By A. C. Galbraith

Industrial Relations Manager,
Douglas Aircraft Co., Inc.

These researches covered many, many phases, but one, I think, has particular significance in the field of counseling and on its immediate future. In a particular department of the Western Electric Hawthorne Plant, in which the employment was confined to girls making a specific article, a department where the output of every employe could be accurately measured not only on an individual basis but departmentally, a series of tests were initiated. It started with counselors being assigned to talk to every employe in the unit. They were particularly alert to any suggestions developed during the interview that might involve the request for a concession of any kind, and as each concession was requested (where consistent with sound business practice and the experiment generally), it was granted and after

a period the output of each employe and the department was carefully measured and compared with data available from that following the granting of the previous concession.

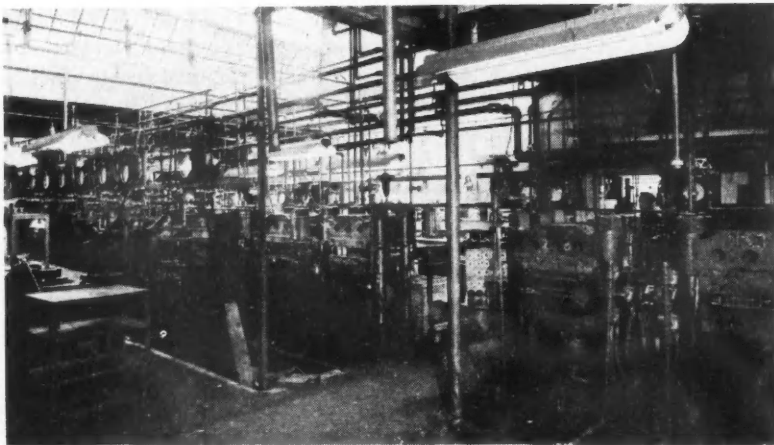
Some of these concessions in the first part of the experiment involved an increase in the piecework rate, a reduction in supervision, periodic medical examinations, various tests in rest periods starting off with two five-minute rest periods, one in the morning and one in the afternoon, later increasing this to ten minutes at each period, then changing to six five-minute rest periods scattered throughout the day; later changing to ten minutes in the morning and fifteen in the afternoon; serving a snack luncheon during the rest period; shortening of the working day; starting earlier and finishing later, and vice versa; a five-day week in summer over a nine week period, without loss of pay. As each of these concessions was granted, as previously stated, the output was accurately measured and in almost every instance there was a slight improvement, at least it was rare that there was any decrease. Some of the plusages in the way of results were better health, better attendance, and emphatically better morale.

Having reached the limit of concessions that could be granted, a halt was called to this phase and then started the second part of the experiment in which, after carefully planned and deliberate explanation to each employe and a mutual agreement, these concessions

(Turn to page 76, please)

**Lord Plant Organized Efficiently
to Make Wide Variety of**

Rubber Mountings for



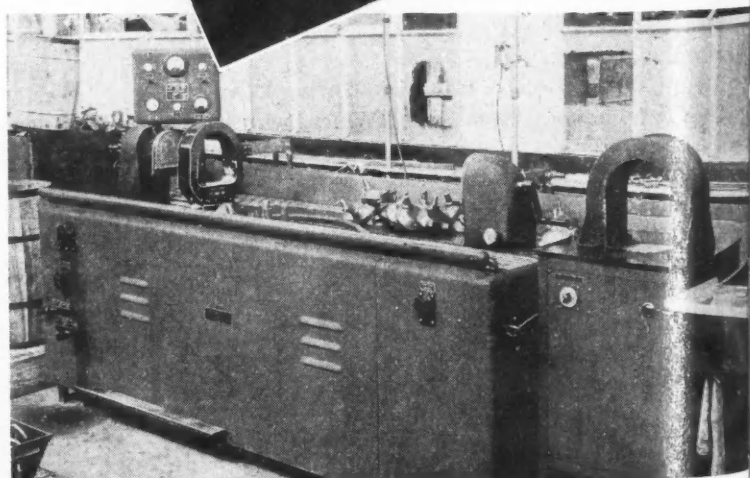
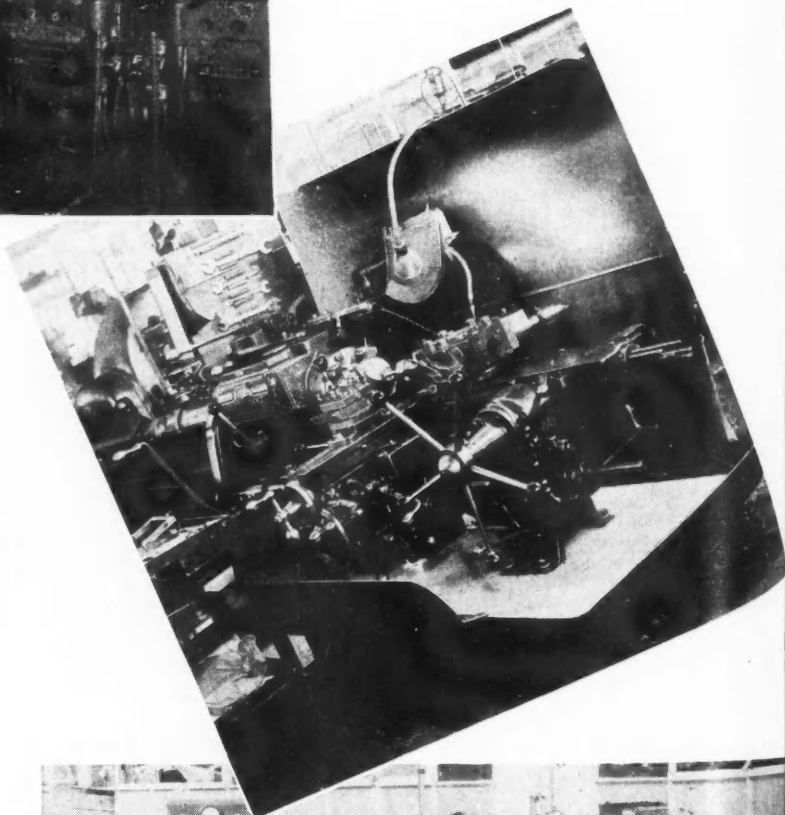
General view in rubber curing department showing the line-up of platen presses. Some of the control equipment may be seen at the left.

SPECIALIZING exclusively in the development and manufacture of bonded rubber shear-type mountings for a variety of automotive, aircraft, and general industrial applications, the Lord Manufacturing Co. has covered the field so intensively that its line now includes the possibility of some 20,000 items, reckoning with the variations in standard and special types of mountings. This amazing total of variations poses a difficult problem of manufacturing, explains to the seasoned production man the emphasis on flexibility of equipment and plant layout for which this organization is distinguished.

The Lord organization devotes its energies to vibration control in all types of mechanical and electrical equipment. Although the major activity of the com-

*(Center)
Close-up of one of the many Warner & Swasey turret lathes installed in this plant. This setup is for the machining of a mounting housing.*

All forgings for Lord mountings are Magnaflux-inspected. This is one of the inspection units with a load of mounting forgings ready for test.



pany
gency
tribut
dustr
the a
stems
soluti
princ
moun
ment
Am
Lord
Autom
Aircra
Marin
Statio
Gas e
Electr
Motor
Compu
Midsh
Fifth
Auton
On
contr
for r
so ar
the e

(Top
Drill
of d
a lar
Delt
mech

Here
setup

Octo

By Joseph Geschelin

S for Vibration Control

pany centers about aircraft products due to the urgency of the war, it is equally as well noted for its contributions in the field of motor trucks, buses, and industrial equipment where specialization has produced the answer to troublesome problems. This activity stems from the scientific work of its founder in the solution of vibration problems in aircraft, directed principally at the proper cushioning of aircraft engine mountings, aircraft instruments, and aircraft instrument panels.

Among the automotive and other applications of Lord mountings are the following:

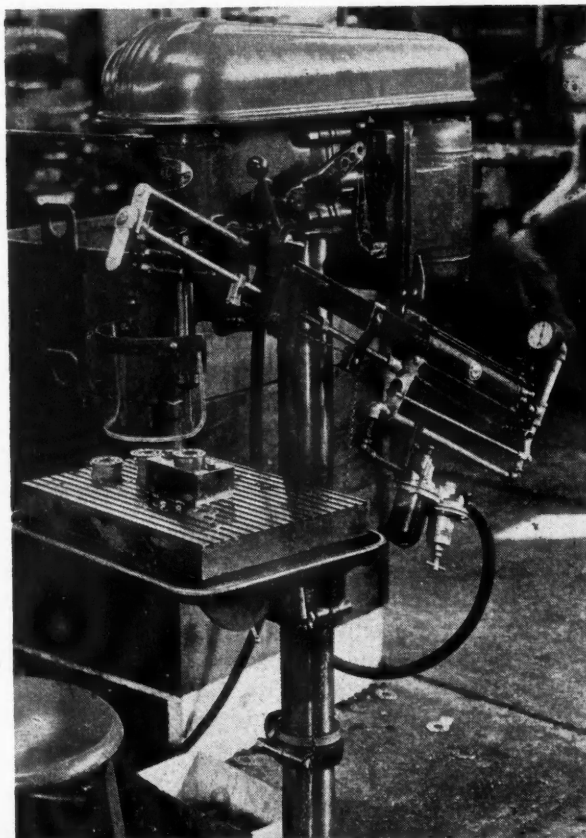
Automotive engines	Radiators
Aircraft engines	Mufflers
Marine engines	Air conditioning equipment
Stationary engines	Refrigeration equipment
Gas electric units	Electric control equipment
Electric motors	Electronic apparatus
Motor generators	Aircraft radio
Compressors	Marine radio
Midship bearings	Instruments
Fifth wheel couplers	Instrument panels
Automotive bodies	Aircraft cameras

One of the most recent developments in vibration control is the introduction of "Dynafoal" suspension for radial aircraft engines in which the mounting is so arranged as to act through the center of gravity of the engine system.

*This is the Eighty-sixth
in the series of monthly
production features*

(Top)
Drilling department features several makes of drilling and tapping machines including a large number of the versatile Delta units. Delta drill heads are fitted with air actuating mechanism for automatic tapping operations.

Here is the electronic induction heating setup with a brazing station at each end of the bench.



As in the case of other progressive companies in the automotive field, Lord maintains a force of trained engineers, skilled in the art, and capable of analyzing and resolving vibration problems posed by airframe and motor vehicle builders. The trouble-shooting work of these men is supplemented by a well-equipped research laboratory in which the conditions of a given problem may be simulated on test equipment and studied to a satisfactory conclusion.

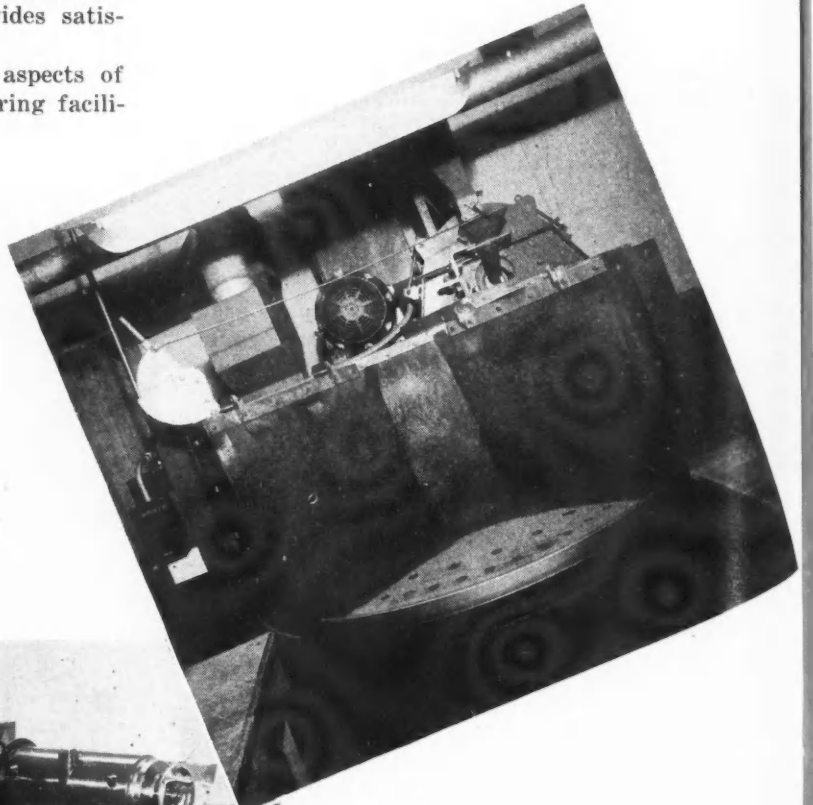
Confronted with the phenomenal growth of military aircraft and the consequent demand for mountings and engine suspensions, this company solved the problem of satisfying its customers, first by an expansion of existing facilities within reasonable limits, secondly by a wise policy of sub-contracting. Today they have a group of fourteen fine companies producing metal parts for mountings. These parts flow to the Lord plant for rubber bonding and final assembly to supplement the metal cutting facilities in the parent plant. In addition, three companies—Lovell Manufacturing Co., specialists in rubber-bonded products; American Meter Co., and Talon, Inc.—have been set up to produce certain assemblies completely from the raw materials, under the supervision of the parent company. This arrangement completely satisfies the wartime requirement of secondary sources and provides satisfactory service to all concerned.

With this background of the business aspects of the company, let us look at the manufacturing facilities. As mentioned earlier, flexibility is of the essence of the operation. Consequently, despite the huge volume of production, the plant is laid out as a glorified job-shop to facilitate a ready flow of the thousands of variations in detail demanded by its customers.

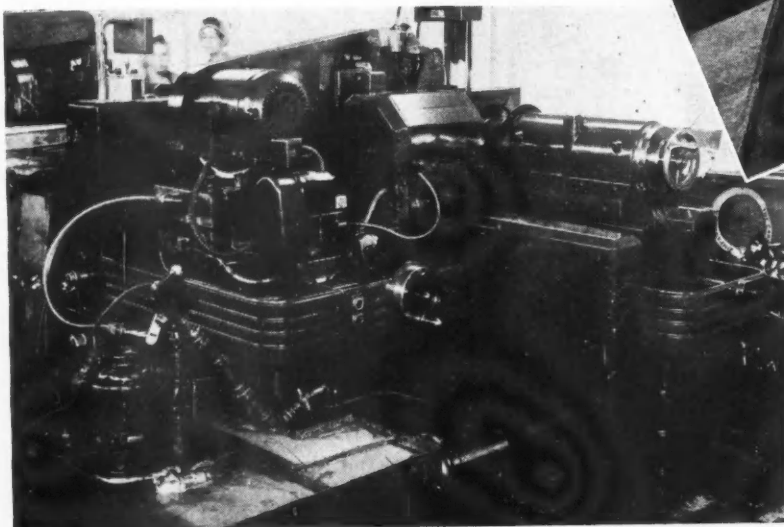
Generally speaking, the plant consists of three principal divisions—(1) Metal cutting departments, (2) Rubber fabrication and bonding, (3) Final assembly department. So far as possible, the metal cutting and rubber fabrication processes are distinct and

independent and are located separately. Metal cutting is on one side, rubber processing on the other side of the building.

To further flexibility, the metal working establishment is departmentalized so that job-lots may be quickly distributed over general purpose type equipment. An exceptional feature of the metal working departments is that the various types and makes of machines installed in the parent plant find their counterpart in the sub-contracting plants. This was achieved by the simple device of providing such equipment to sub-contractors at the time the facilities were initially planned. This unique arrangement implies that all work is done in accordance with a standardized routing, on the same type of machine, and using the same types of fixtures and gages, wherever the part may be produced. Moreover, in the event of a breakdown of an operation in one of the plants, for any of a number of causes that may be visualized, it is possible for another plant in the chain to pick up the operation and with a transfer of material prevent a production bottle-neck.



(Above)
Prior to bonding operations, certain of the metal parts are sand-blasted on this table type Wheelabrator.

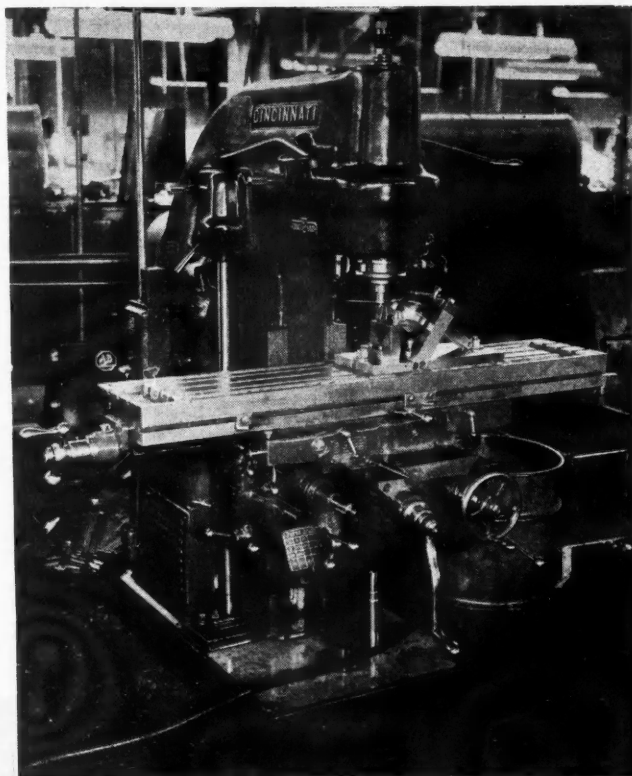


Here is a new Ex-Cell-O precision internal thread grinder recently installed in this plant.

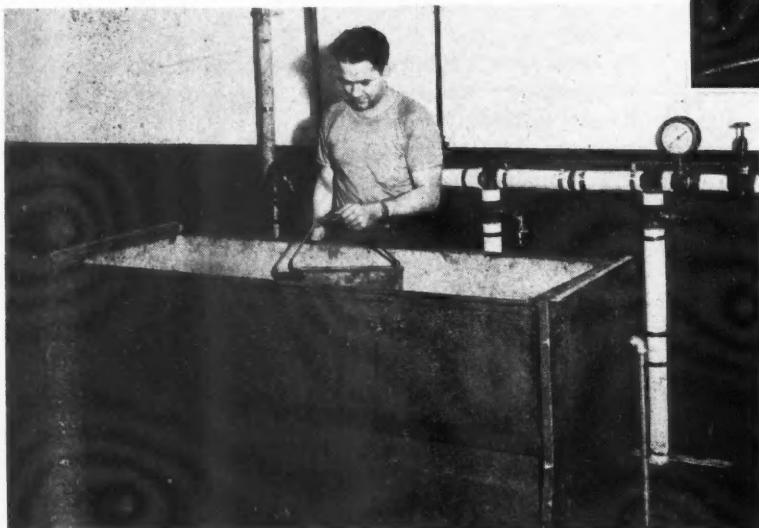
Manufacturing facilities are supplemented by the development laboratory which is charged with the responsibility for the development of new applications and trouble-shooting; and by several control laboratories which will be noted later.

Quality control is a basic project, being handled through a comprehensive inspection setup. In addition to the usual gaging devices, hardness testers, etc., Lord uses a number of Magnaflux machines which are employed for the surface testing of steel forgings and various stressed parts.

Due to the multiplicity of metal cutting operations, constituting a large percentage of the production effort, special attention has been given to the selection of cutting tools. Not the least of the problems is the fact that the majority of the forgings used in engine suspensions are of alloy steel received in heat treated and hardened condition. Consequently, it is not surprising to find that many Kennametal and Carboloy cemented-carbide tools of special steel cutting grades



Cincinnati and Milwaukee mills are installed in the milling machine department. This view shows one of the Cincinnati vertical mills.



(Left) One of the new Blakeslee degreasing units recently installed here.

are widely employed for the tooling of screw machines and Warner & Swasey turret lathes. To assure constant improvement in productivity and cost, a tool engineer spends all of his time following these tool setups.

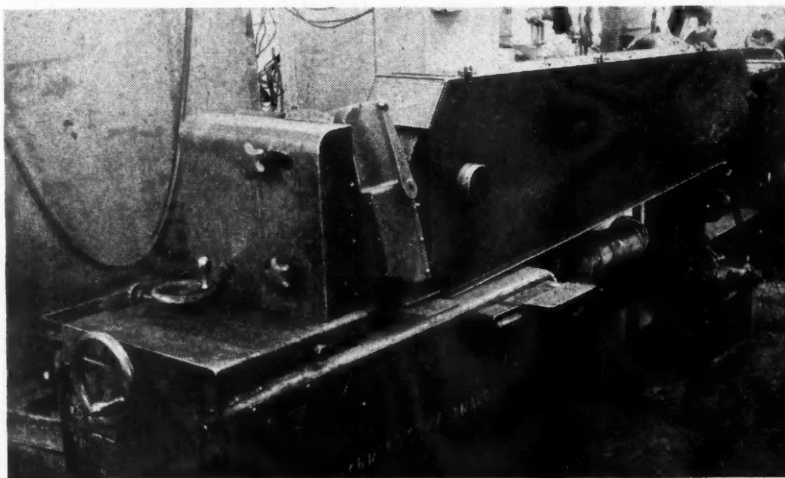
From the factory management standpoint it is of interest to find that the plant has been equipped with the Trumbull duct system of power distribution which makes it convenient to plug in machinery at will, providing the additional advantage of ease of moving ma-

chinery from one department to another if necessary.

Although plating and anodizing are widely employed in Lord products, this work is all contracted in outside plants located nearby. Other forms of protective films are commonly used, including painting to military specifications and

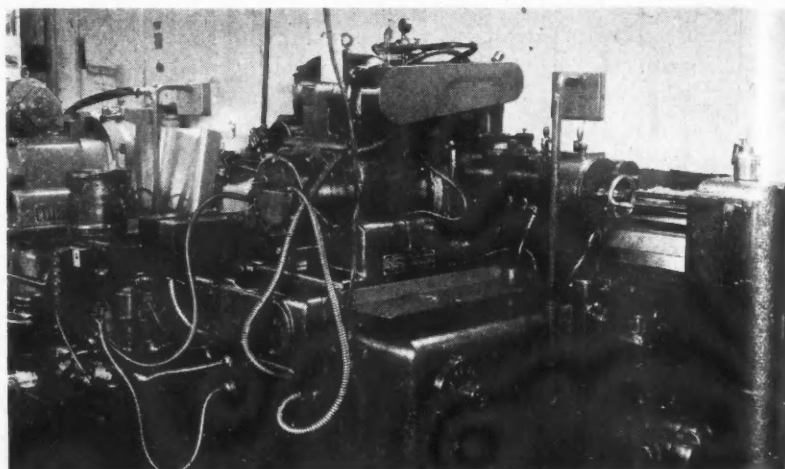
Parkerizing.

Among the many interesting techniques employed



Close-up of horizontal type belt sanding machine in the polishing room. This unit, built by Hammond Machinery Builders, is employed for the polishing of OD of Lord tube-form mountings.

Grinding department boasts a large battery of precision thread grinders—both internal and external. This is a view of one of the latest type J & L internal thread grinders.



here, one of the latest is the introduction of low-temperature induction heating, in which composite metal assemblies are produced by hard silver soldering. This procedure stems from advanced design in which relatively heavy parts are integrated from light sections instead of attempting to forge and machine large parts with the consequent expenditure of man-hours and wastage of critical metal in chips.

Another item of interest is the installation of two new De-Vilbiss spraying machines of automatic type. These have automatic spray sections at each end and a baking furnace section in-between. Blakeslee vapor degreasing equipment is employed for the cleaning of metal parts prior to rubber bonding operations.

Machine Shops

Metal cutting departments are set up as follows: Drill press section with Leland-Gifford drills, Delta bench type drills, Cincinnati-Bickford drills, and tapping equipment. In the latter category, beside Haskell tappers, they have introduced several newly developed external lead screw tappers made by the Cleveland Tapping Machine Company.

Milling machine department includes, primarily, Cincinnati vertical and horizontal mills, and Brown & Sharpe mills. Then there is a small punch press department whose output is supplemented by a large punch press operation in one of the sub-contracting plants.

Perhaps the largest department in the group is the turret lathe and screw machine, featuring various types and sizes of Warner & Swasey machines, exclusively. These are all fitted with Kennametal tools—all ground with negative rake. Lord advises that the

practice of grinding negative rake on cemented-carbide tools for hard steel cutting was initiated here about three years ago. The grinding department features Cincinnati centerless grinders, Ex-Cell-O and Jones & Lamson precision thread grinders, including machines of each make designed for grinding large diameter internal threads; some surface and universal grinders. As mentioned earlier, these metal cutting departments have their exact counterpart in sub-contracting plants, featuring the same types and makes of equipment.

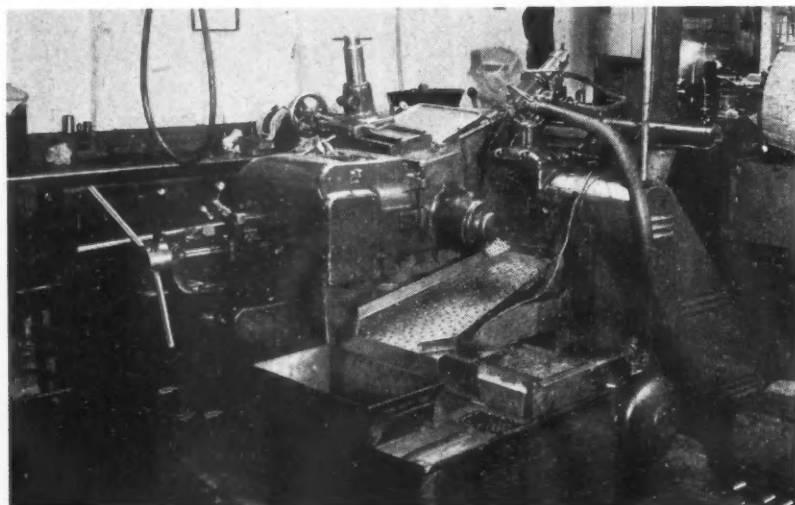
Rubber Department

The rubber department is self-contained in another section of the plant. At this writing many of its major departments such as compounding and molding have undergone transformation by additions of equipment and through re-arrangements. Operations in this department begin with techniques familiar in rubber plants—compounding and milling on specialized rubber equipment, the calendaring of rubber strips and sheets, tube-milling of cylindrical sections. This department is controlled by a batch control laboratory whose function is to test each individual batch of compounded rubber and approve it before calendaring or tubing operations are permitted to run through.

In this area will be found Blakeslee vapor degreasing equipment for chemical cleaning of all metal parts in preparation for rubber bonding. In another room there is a new American Wheelabrator which is used for the sand-blasting of various metal parts, particularly sheet metal stampings to remove burrs and sharp edges.

Without attempting to cover the rubber bonding technique, it may be noted that in preparation for making up the metal-rubber assemblies, the tubed

(Turn to page 94, please)



Close-up of one of the Cincinnati Centerless grinders.

THIS chart, which was prepared by the Non-Ferrous Metals Sub-unit of the AAF Materials Distribution Branch at Wright Field, Dayton, is intended to give a general picture of where the time goes when a brass mill starts working on an order and thus aid company executives when placing orders and planning production schedules. The figures are necessarily approximations, but they are considered as nearly accurate as can be estimated in these days of all-out production effort.



*DELAY FACTORS

1. Waiting for carload lots before shipping from mills.
2. Government inspection time.
3. Specifying exceptionally close tolerances.
4. Refractory alloys — silicon, aluminum, beryllium, phosphor bronzes, etc.—take more time to produce than the ordinary alloys.
5. Machine breakdown delays. (Under CMP, mills are allowed to ship in month after promised delivery month if breakdowns occur.)

NOTES

Pure copper products in forms and sizes shown take about the same time as alloys.

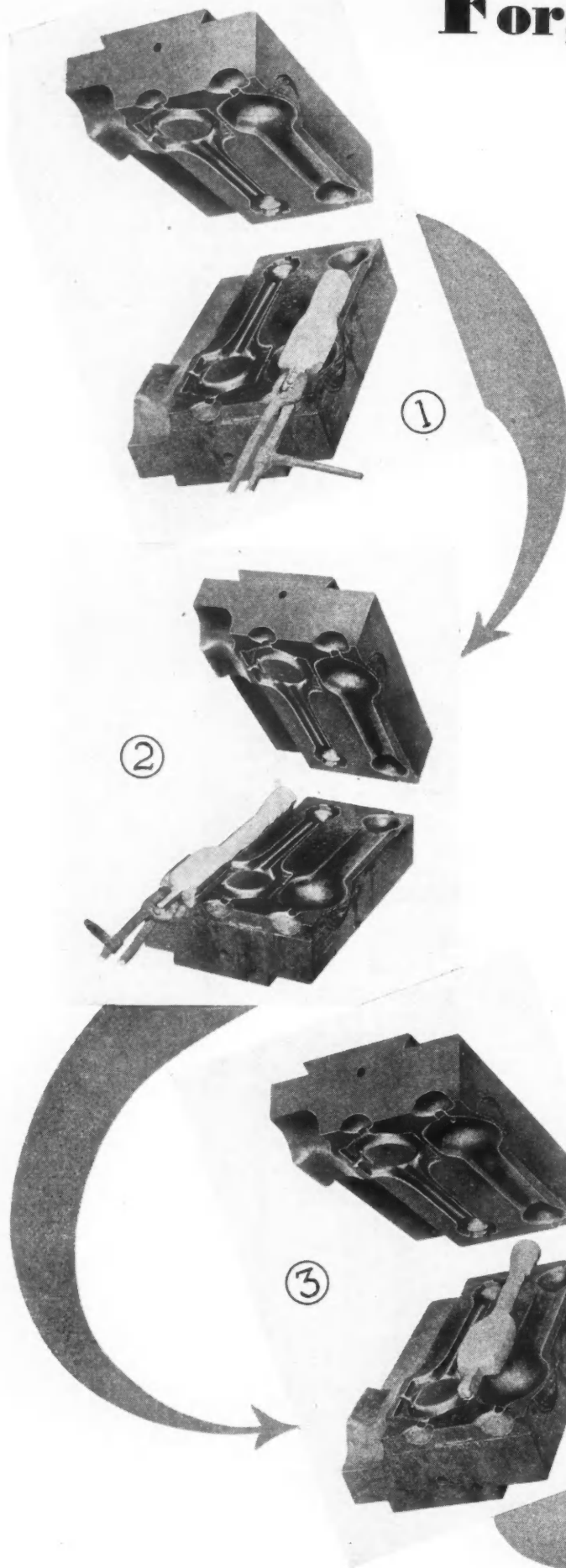
Forgings need extra operations, adding about two weeks to rod and bar schedules shown.

Castings depend on finish required.

Under CMPF mills can reflect refractory

alloy orders placed less than 60 days prior to specified month of delivery, and other metal orders under 45 days.

Forging an 84-Lb.



1. ROLLING IMPRESSION—The first operation on the billet is the preparation of the "tonghold"—a projection at the end of the forging to permit the stock to be gripped by the forging craftsmen with a pair of tongs. After the tonghold is formed, the heated billet is placed in the rolling impression on these preforming and blocking dies. The stock is rolled between successive blows in the hammer and this action elongates the metal from one end of the billet to form the portion which will be the arm section of the connecting rod.

2. FULLERING—The fullering operation reduces the cross section area of the portion of the metal stock between the large end boss and the piston end of the connecting rod. Fullering forces the metal to move outward and away from the center of the fuller.

3. FLATTENING the large end boss is accomplished by striking the stock on the flat surface of the die prior to the blocking impression. This is done to make the forging stock conform more closely to the blocking impression.

4. SECOND ROLLING IMPRESSION—This second rolling impression reduces and gathers the forging stock to the proper proportion required for each section of the connecting rod and smoothes out irregular surfaces. The distribution of metal thus obtained assures that the metal when formed in the blocking impression will reach the sidewalls of the die impression throughout its perimeter simultaneously.

5. BLOCKING—The blocking operation which forms the rod into its first definite shape, consists of several successive blows in the hammer which compel the hot metal to flow into and completely fill the die impressions for every section of the rod. Working the metal in the dies produces grain flow to conform to strength requirements in the forged rod. The blocking operation produces a favorable grain flow.

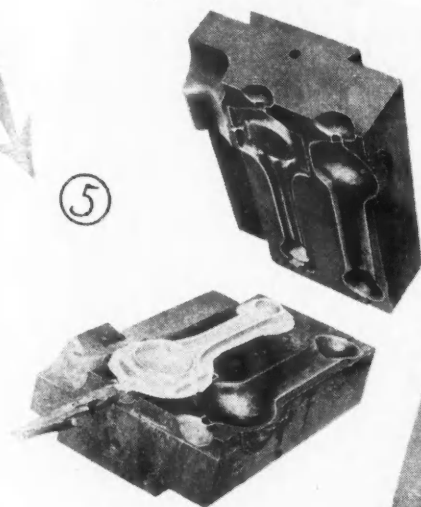
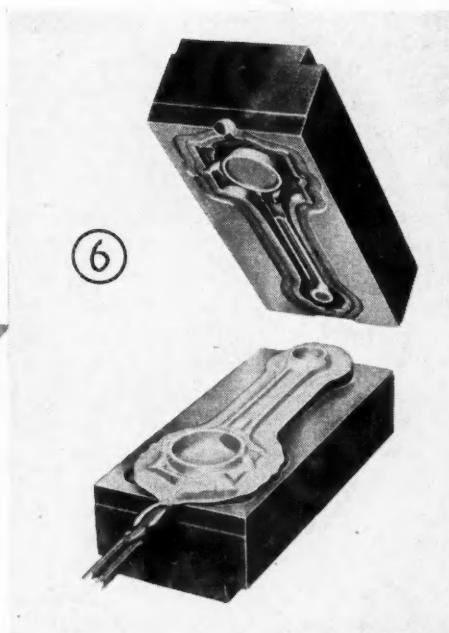
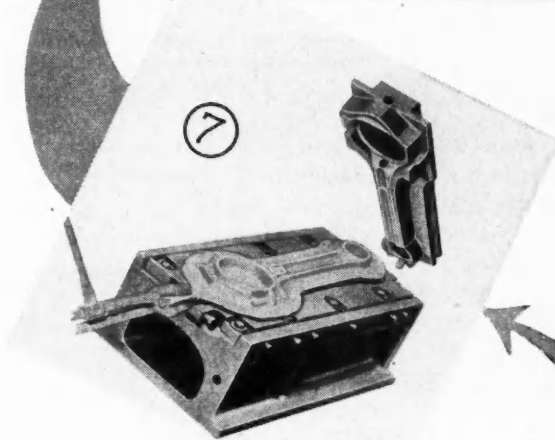
Connecting Rod for Diesel Engine

Successive operations are illustrated here for transforming a 4-13/16 by 4-13/16 in. steel billet 18½ in. long into a connecting rod 38 in. long

6. FINISHING IMPRESSION—This second set of closed dies contains the finishing or final forging impression which also has the effect of further improving the physical properties of the forgings. In the photo is shown the effect produced by the final or finishing operation consisting of several successive blows in the hammer. If all of the preliminary steps have been properly followed, there is little danger of an unsatisfactory finished forging.

7. TRIMMING OPERATION—The flash is trimmed from the forging in a trimmer press, the trimming being done immediately after the finishing impression is completed and while the metal is still hot. These trimmer dies for this operation are quite different from the ordinary set of trimmer dies. In this case the trimmer dies include punches for punching holes in both the crank end and piston end of the connecting rod. The trimmer punch is machined so that it will force the forging through the trimmer blades.

8. FLASH FROM FORGING—Trimmer dies immediately after the trimming operation. Note that the flash remains on the trimmer blades while the trimmed forging has dropped down into the bottom of the die, after which the forging is removed from the opening at the bottom of the trimmer blade die. Then the rod is ready for heat treating and machining. The amount of machining and finishing necessary has been reduced to a minimum by the precision work in forming this forging in closed dies to a close weight tolerance. The weight of the finished rod is approximately 84 lb.



Use of Glow Plugs

By A. F. Klingner

Edison-Splitdorf Corp.

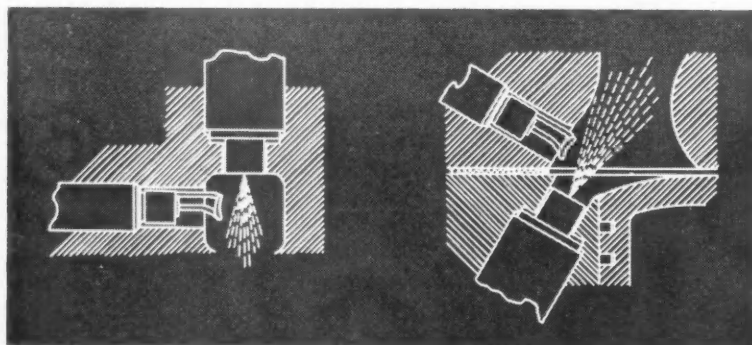


Fig. 1—Placing of glow element in the fuel spray should be avoided to minimize corrosion.

VARIOUS ways and means of cold starting for Diesel engines have been expertly presented by P. M. Heldt in the May issues of *AUTOMOTIVE and AVIATION INDUSTRIES*, so that further discussion on this subject is not the purpose of this article but rather a more detailed description of the use and service of glow plugs for starting purposes. Great difficulties are frequently experienced in starting cold high-speed Diesel engines as cold engines absorb a considerable amount of heat from the compressed air with the result that the compression temperature in the combustion chamber is so low that ignition of the fuel air charge fails to take place. In many Diesel engines cold starting will result in late or partial combustion or frequently no ignition at all. Such late or partial combustion results in destructive pounding and hammering of the working parts and bearings. Much more dire results can happen with ignition failure because the unburnt fuel within the combustion chamber could unite with the incoming fuel charge in the next firing stroke, thereby causing an explosion-like combustion, likely to damage the engine seriously.

Difficulties in starting occasioned by a cold engine are oftentimes overcome through the use of glow plugs which are standard equipment on many Diesel engines, especially on the European continent. The development and use of glow plugs dates back to the period in the 1930's when due to economical operation, development of Diesel power leaped ahead, especially

in England, Germany, France and Italy. Various starting means have been experimented with but the glow plug, due to economical current consumption from the necessary starting battery, has been adopted by many European manufacturers. By 1936, three prominent ignition manufacturers, two in Germany and one in France, were producing glow plugs in quantities for the Diesel trade. In the United States the Edison-Splitdorf Corporation, a subsidiary of Thomas A. Edison, Inc., entered the field as pioneers some years ago, and through the results of vast research and tests, developed a line of glow plugs, switches and resistance units to facilitate their use and application to high-speed Diesel engines.

Glow plugs, sometimes called heater plugs, because the element is electrically heated to approximately 1700 F, act as a catalytic igniter taking the place of a spark plug. It is sometimes incorrectly thought that the heat emanating from the resistance element of the glow plug raises the compression temperature within the combustion chamber of the engine sufficiently to ignite the fuel air charge. However, this could not be heated enough to secure self-ignition within the short space of time available. When the glow plug has fired the engine for a sufficient length of time the current can be switched off.

In the design of the cylinder head the placement of the glow plug is of vital importance and under no circumstances should the glow coil be placed in the path of the fuel spray as shown in Fig. 1, as rapid corrosion would result. It should also not extend too far into the combustion chamber, nor should it be placed too

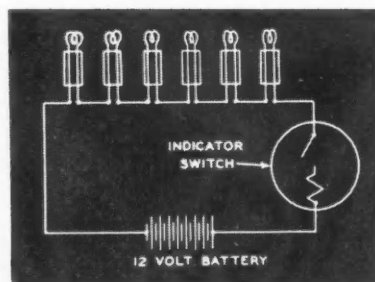
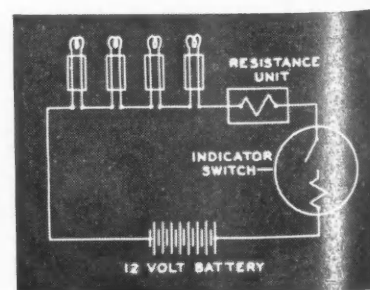


Fig. 2—Wiring diagram for a two-pole glow plug installation on a six cylinder engine.

Fig. 3—Wiring diagram for a two-pole glow plug installation on a four cylinder engine.



in Cold Starting Diesel Engines

close to the exhaust valve, since the action of the burning gases would be injurious.

Glow plugs are made in single and double pole construction. Double pole plugs are preferable as they are more economical, being wired in series, thus saving current. Single pole plugs are wired in parallel to the battery and only are recommended for single or two cylinder engines. The wiring diagrams, Figs. 2

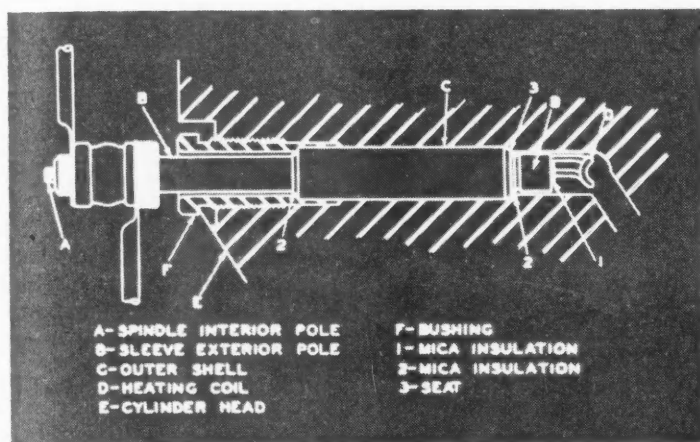


Fig. 4—Construction of an Edison two-pole glow plug.

and 3, show the simplicity of two-pole glow plugs. The starting battery, being the determining factor, is connected through a switch in series with the glow plugs, the number of which are determined by the number of cylinders. This allows each plug a fraction of the battery voltage. This division of the voltage can be made with any desired number of glow plugs (current consumers). An application of glow plugs for a six and a four cylinder engine is shown as an example in Figs. 2 and 3. In Fig. 2, from a 12 v battery six glow plugs and one indicator switch are each supplied with a 1.7 voltage, balancing the circuit of 12 v. In Fig. 3, from a 12 v battery four glow

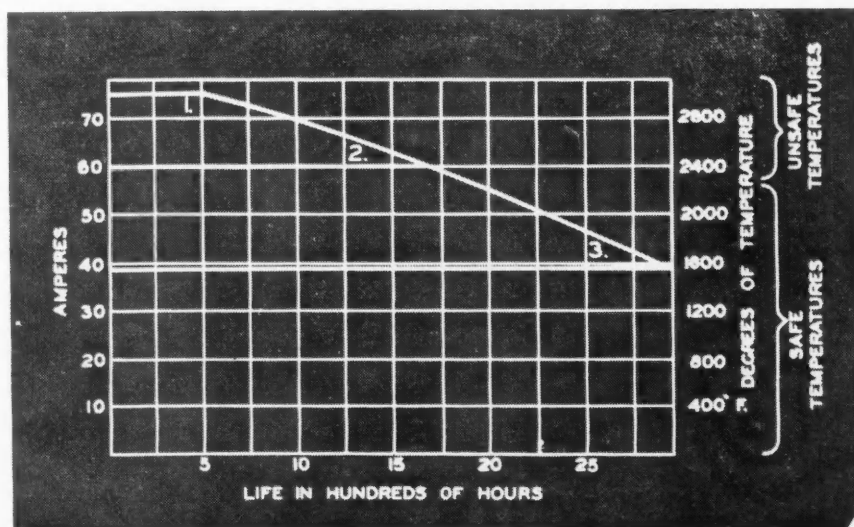
plugs and one indicator switch, each of 1.7 v rating and one resistance unit of 3.4 v will balance the circuit of 12 v.

Past experience has shown that rather than build numerous types of glow plugs of different ratings, which have caused considerable trouble due to misapplications, it is the better policy to standardize the rating of the glow plugs and absorb the difference of the voltage in a small resistance unit of standard design. The rating of the glow plug described above is 1.7 v, 37.5 amp, energy 64 w, and resistance .046 ohms.

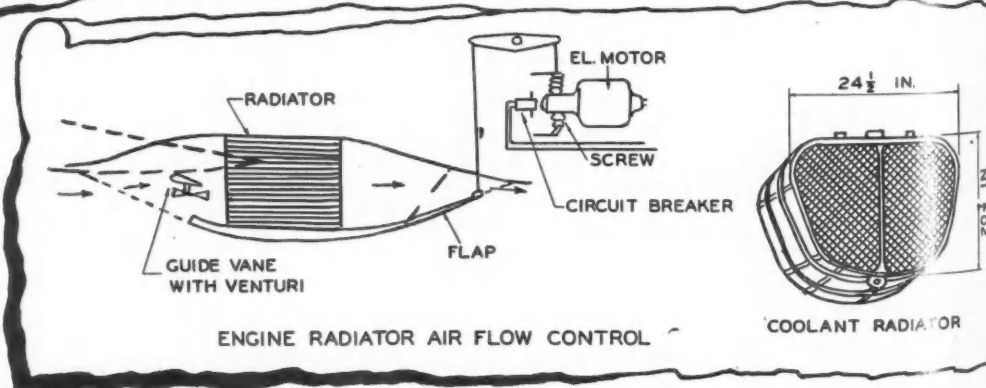
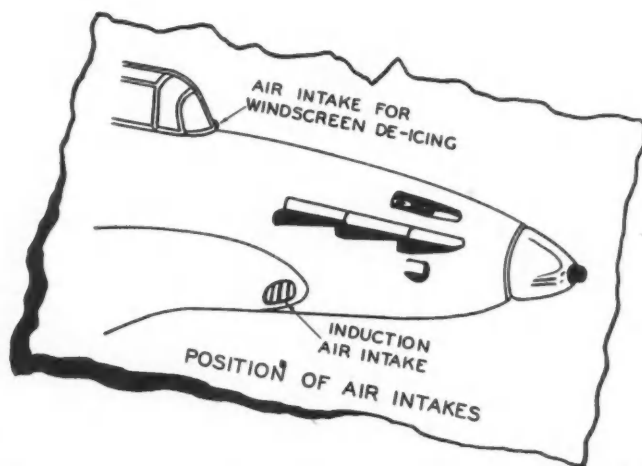
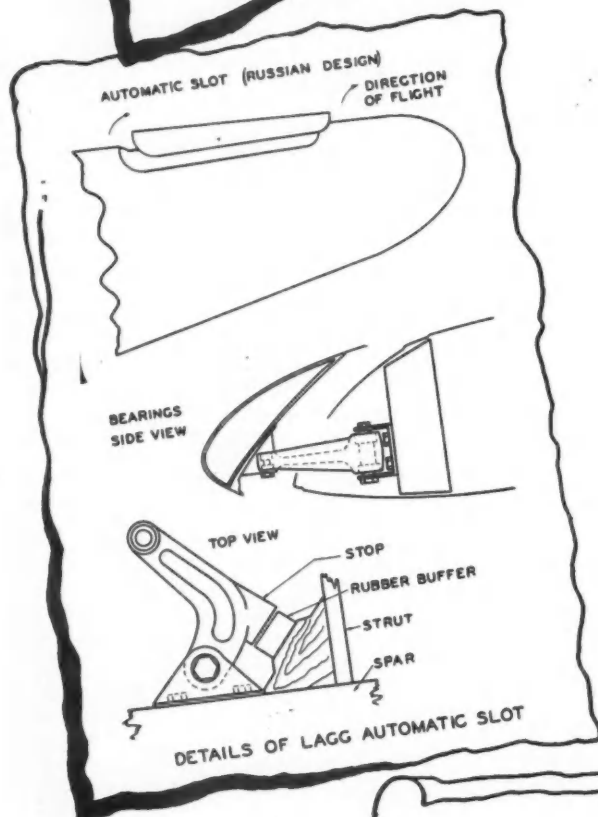
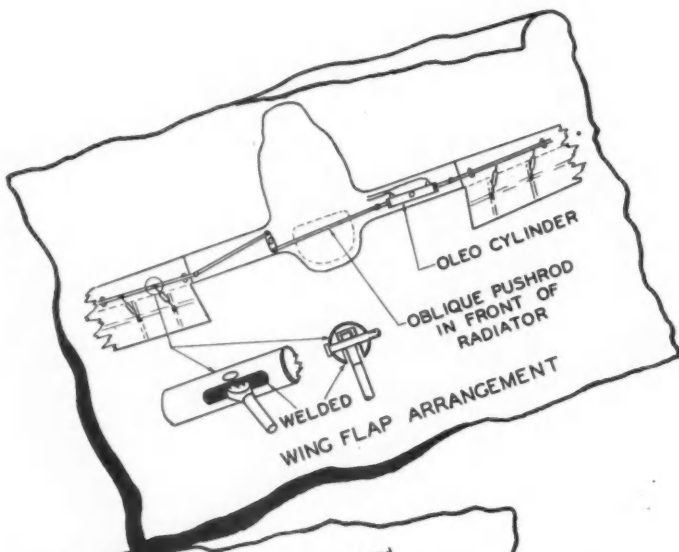
The construction of the glow plug must be of the highest quality in material and workmanship as the tip of the plug and the glow coil are subjected to sudden changes of temperatures in the cylinders, and exposed at all times to the high pressure, temperature and vibrations while the engine is running. Edison glow plugs are comprehensively designed to promote greater efficiency and quicker starting due to years of painstaking development and tests. Their improved construction features absolutely gas-tight joints of the electrodes; first-class insulation of mica between the center spindle, side electrode and body; special permanent joints between body and electrode wire eliminates starting failures due to poor connections. The heating element has been especially designed and drawn so as to be extremely resistant to corrosion and, if properly taken care of, offers long and useful service. The alloys used in all metal parts have been carefully selected and tested

(Turn to page 64, please)

Fig. 5—Element life test chart of two-pole glow plug installation at 3000F, 2400F and 1525F in a six cylinder engine.



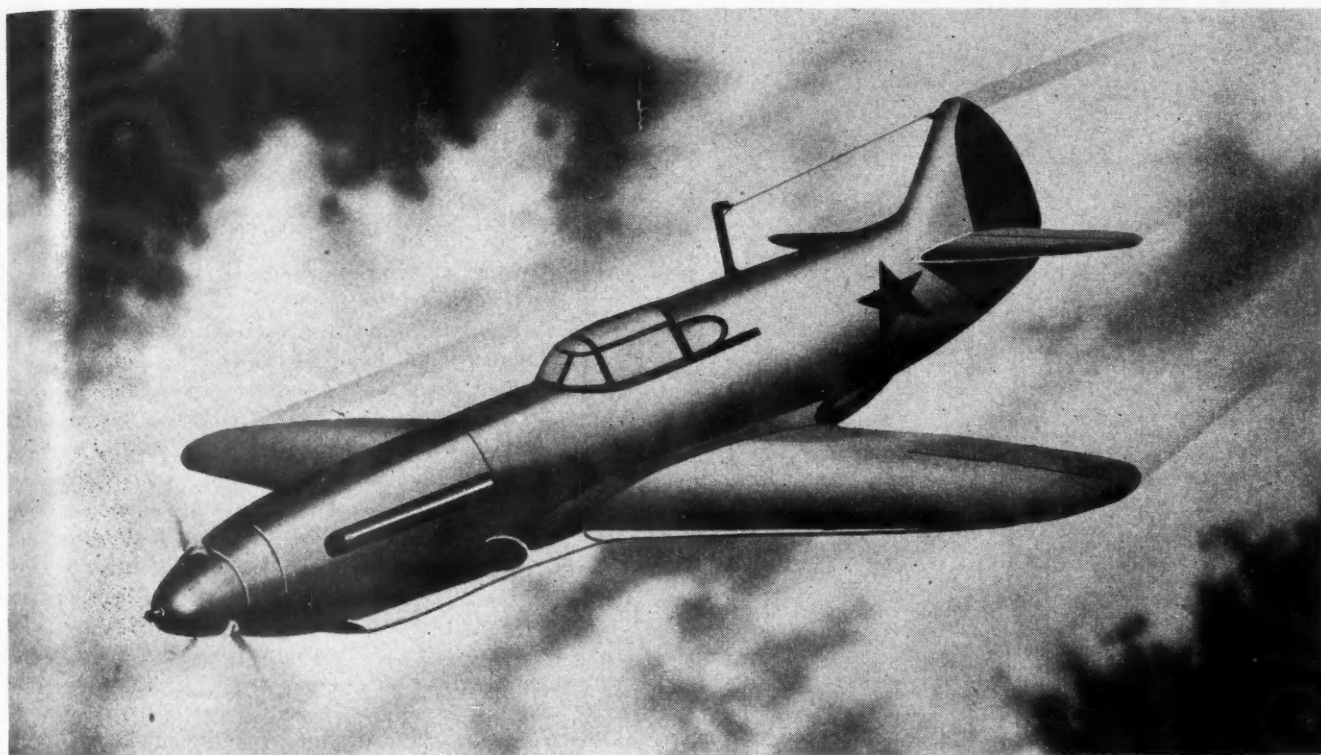
Swedish Report Reveals Details of Soviet Warplane, Fuselage and Wing Are of Wood Construction. Engine is 12-Cylinder, Liquid-cooled Vee-type Equipped with Six Carburetors and Two-stage Two-speed Supercharger.



THE most comprehensive information yet made available concerning the constructional features and characteristics of any Russian military aircraft is given in a translation of a Swedish report issued by the British Ministry of Aircraft Production. The aircraft in question is the Lagg-3, a single seat fighter said to be one of the most successful of its type employed by the Soviet Air Force. Some of the examples to which the Swedish report refers were captured in good condition by the Finns, who granted facilities to Swedish technicians for a detailed examination and test flights. From other sources it has been made known, however, that the Lagg-3 is not the latest of its type, but although it has been modified in certain other respects the changes consist chiefly of a more powerful engine and heavier armament.

The Lagg-3 has a 1100 hp 12-cylinder 60 deg. Vee upright engine known as the M-105P type. "P" signifies "pushka" (i.e. cannon) and implies that provision is made for a cannon with its barrel passing through the bore of the propeller shaft. The armament consists of a 20 mm cannon and two 12.7 mm (0.5 in.) machine guns above the engine with

Russian



Lagg-3 Fighter

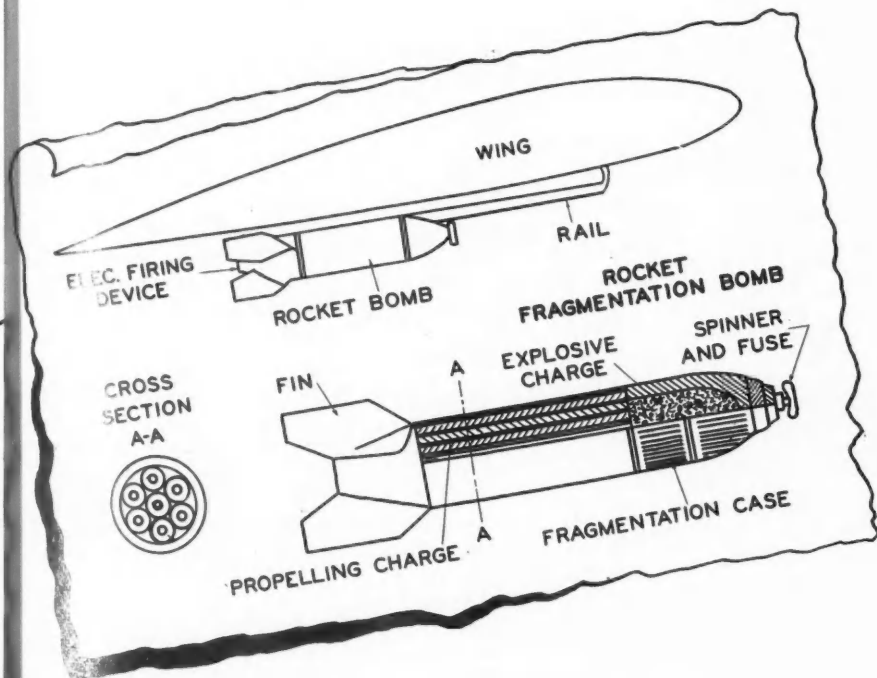
synchronizing gear for firing through the propeller. But according to Russian airmen taken prisoner, a later series of this aircraft, the Lagg-5, has a 1600 hp engine of the same type, the M-105P2, two 20 mm cannon and a higher maximum speed of 385 mph as compared with 348 mph. The following particulars relate to the 1100 hp engine:

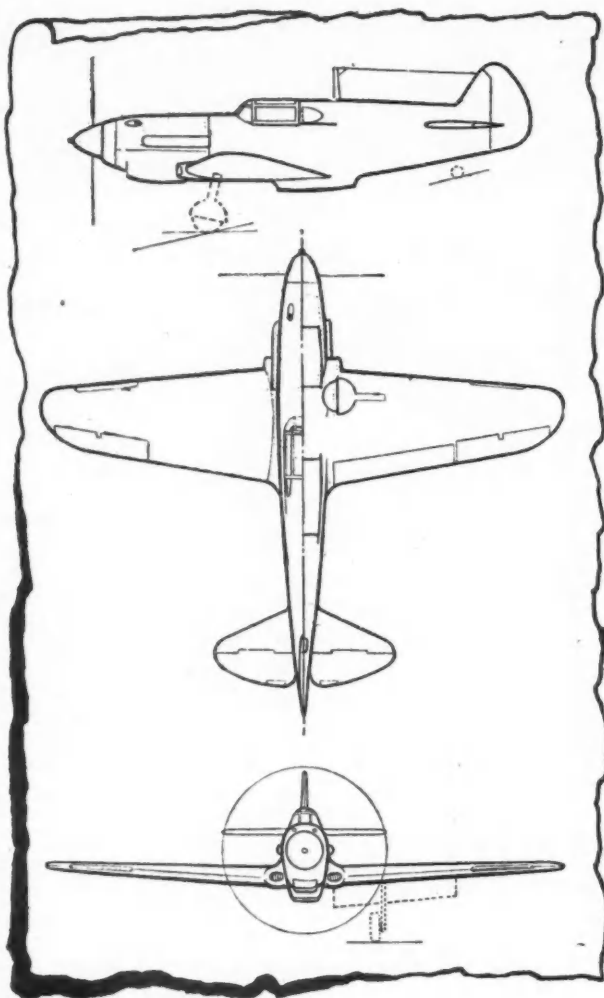
Piston displacement	2196 cu in.
Maximum power	1150 hp at 2700 rpm, 13,100 ft.
Overall length	79.7 in.
Overall height	37.7 in.
Overall width	30.3 in.
Weight (dry)	1267 lb.
Weight per hp	1.12 lb.
Compression ratio	7 to 1
Supercharger gear ratios	7.8 to 1 and 10 to 1.
Fuel	94-95 octane gasoline

Design and performance data given in the Swedish report include the following:

Length of aircraft	29 ft 5 in.
Wing span	31 ft 9 in.
Wing area	188 sq ft.
Weight (empty)	5770 lb.
Weight (loaded)	7000 lb.
Wing loading	37.2 lb sq ft.
Power loading	6.37 lb hp.
Aspect ratio	5.55 to 1.
Maximum speed	348 mph at 16,500 ft.
Landing speed	87 mph
Climb	10,000 ft in 5 min.
Service ceiling	30,000 ft.
Endurance	2½ hrs.
Range	400 miles

In general appearance the Lagg-3 is reminiscent of the Spitfire, though in another respect it resembles the British Mosquito, for it is mostly of wood construction. A feature of note, believed to be unique, is the use of the exhaust to provide an inert gas which, after cooling and filtering, is led into the fuel tanks to displace air as a measure of fire prevention. Under the wings provision is made for carrying six





Courtesy of *Flight*, England

rocket fragmentation bombs, which are now extensively used by the Russian Air Force.

The monocoque fuselage is built up on birch frames with plywood facing on both sides. The wooden longérons are of continuous triangular cross section with the base towards the skin, which consists of diagonal strips of plywood. The latter is a 4-ply Russian birch and the bonding, according to a German source, a phenol-formaldehyde or urea-formaldehyde resin. Besides being used as an adhesive, the plastic bonding is made to serve also as an impregnating medium, as evident from the heavy coating on the whole of the interior of the fuselage.

A conventional center section, with two outer sections, forms the basic structure of the wings. The wing spars are of box section with flanges of plastic bonded veneer strips $13/32$ to $19/32$ in. thick, each strip being built up of veneers about $5/64$ in. thickness. Webs of 3-ply birch $5/32$ in. thick are interposed and the spar sheathed on both sides with $1/16$ in. 3-ply birch. The front spar is $3\frac{15}{16}$ in. thick and $10\frac{1}{4}$ in. deep at the wing root, while the corresponding rear spar is $2\frac{9}{16}$ in. thick and $7\frac{7}{8}$ in. deep. Spar fittings are of welded sheet steel. Wings have split flaps of duralumin sheet with single piano hinges and are operated by pushrods moving in duralumin rollers.

The undercarriage is hydraulically operated and of conventional design, retracting upwards and inwards.

The tail wheel retracts rearwards and is centered after takeoff by springs. Control valves are push-button operated. Hydraulic fluid is 65 per cent glycerine and 35 per cent alcohol. The hydraulic system also operates the wing flaps through a rather involved arrangement of levers. Shock absorbers are oleo-pneumatic.

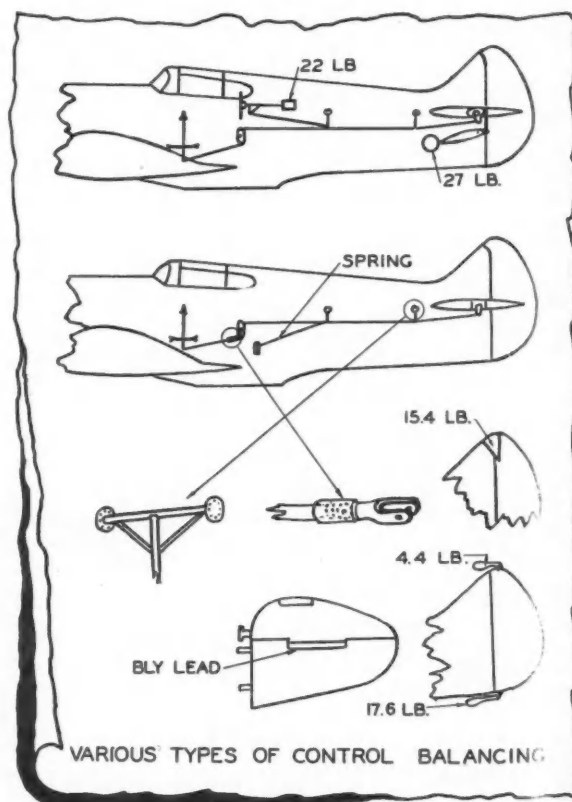
All control surfaces are fabric covered on metal frames, but the tail fin, integral with the fuselage, and the tailplane, attached to a special spar at the rear of the fuselage, are of wood. Ailerons are of normal design with partial slot effect and lead-weighted leading-edge balance and have a differential control. The elevator has two trimming tabs acting also as servo tabs and, like the ailerons, is operated by pushrods.

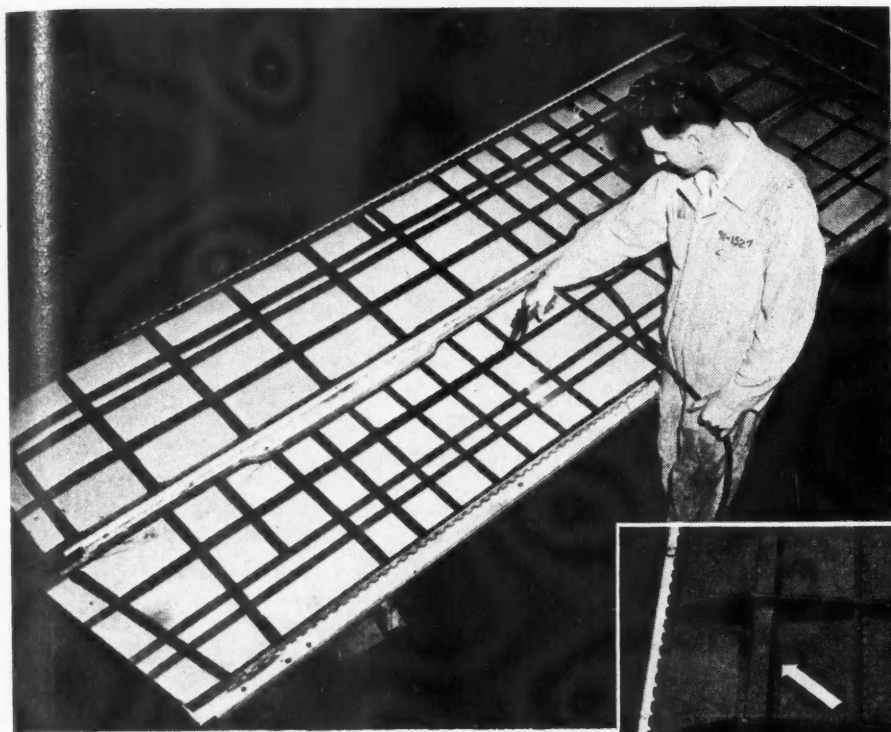
Balancing arrangements of the control surfaces differ on three machines examined. In one case two pendulum elevator balance weights are fitted, one just aft of the pilot and the other just in front of the tail-wheel. These weights—22 lb and 27 lb respectively—are coupled, the heavier rear one raising the elevator against the depressing action of the front one. In another version the forward weight is displaced by a spring and in yet another case both pendulum weights and springs are omitted and the control surfaces themselves are statically and dynamically balanced.

Again, rudder balancing in one case is by means of a 15.4 lb lead weight on the upper horn balance, while in another instance drop-shaped lead balance weights, one 4.4 lb and the other 17.6 lb, are fitted above and below the rudder on lever arms projecting forward of the rudder post.

The Lagg-3 is equipped with pneumatically operated double band brakes. Distribution of air to port

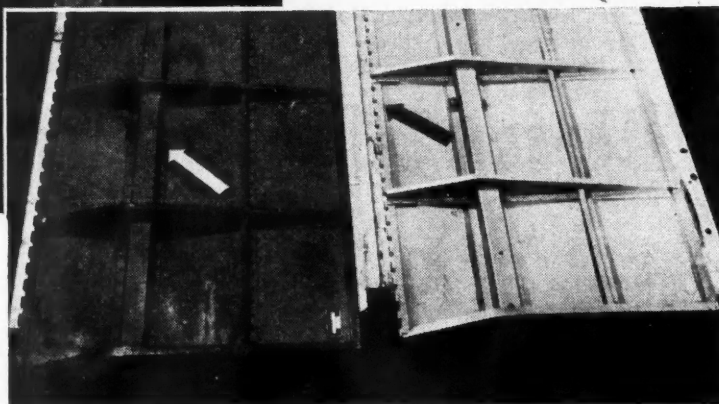
(Turn to page 60, please)





(Left) In the Cyclewelding process the cement used for attachment of ribs and other structural parts is applied with a special gun as shown.

(Below) Two identical airframe elements showing a comparison between the Cycleweld process and conventional riveted construction. The right view shows a Cyclewelded wing flap with a virtual elimination of rivets except at a few critical points. The left view shows the riveted construction.



Cyclewelding

Applied Successfully to Airplane Subassemblies

CYCLEWELD, the Chrysler process for bonding metal to metal, wood, rubber or plastic, has been so developed and improved that it now is being used by a number of manufacturers for uniting aircraft parts, including the production of wing flaps, ski pedestals for gliders, fiber and wooden gasoline tanks, certain structural sections of bombers, and numerous other parts. Development of the Cycleweld method, which is based on a specialized cementing technique, was directed by S. G. Saunders, production research engineer of the Chrysler Corp., who had the cooperation of the Army Air Forces Materiel Command in Dayton and the Navy Bureau of Aeronautics in Philadelphia.

The bonding technique is extremely simple, employing the use of suitable dies in which the parts to be joined are held under the proper curing temperature and under moderate pressure to produce conformity. To this end, one element of the die is made of rubber so as to provide an elastic medium, thereby permitting the metal to iron out properly. In production operations the parts to be joined by Cycle-Welding are surfaced with a specially prepared cement which can be brushed on or applied in the form of a tape, then bonded in the press. Preliminary production work on Cycleweld cement is handled by the Goodyear Tire &

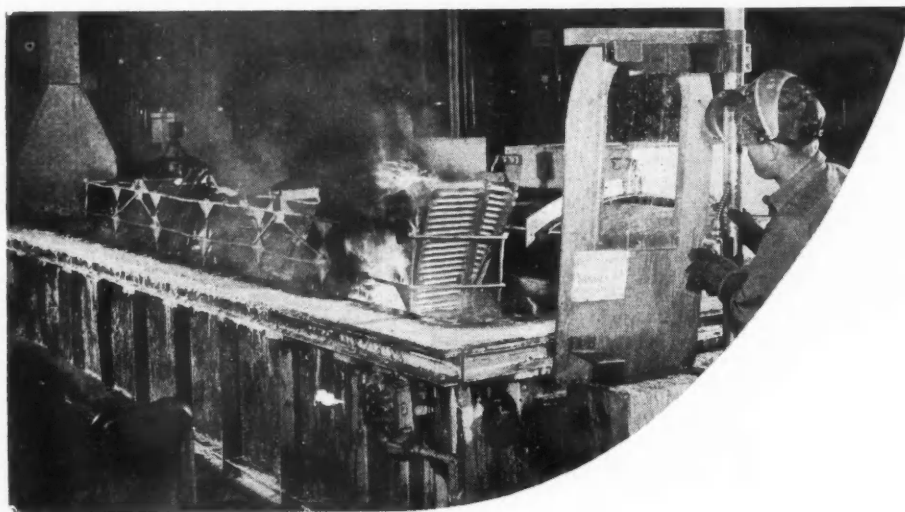
Rubber Co., the final work being done by Chrysler.

This process, in common with all production techniques, has certain applications to which it is peculiarly well adapted. For example, it is best employed in the joining of relatively thin gage sheet metal. This stems from the fact that in Cyclewelding it is essential to have close conformation of laminations during the bonding operation in order to take full advantage of the entire area provided for the cemented sections. It may be appreciated that only thin sheets are capable of such conformation even when abnormal pressure may be feasible.

The Cycleweld process can be used on any aircraft subassembly to which pressure can be applied. However, riveting or bolting is necessary in locations where there will be cleavage loading.

Stabilizers have recently been fabricated by the Chrysler Cycleweld method which withstood static, loading and severe vibration tests just as well as, and in many instances better than, spot welded or riveted stabilizers. These Cyclewelded stabilizers were almost twice as rigid as the riveted stabilizers. On one stabilizer the number of rivets was reduced from 5500 to about 30.

Tests were made recently comparing Cyclewelded
(Turn to page 94, please)



Aluminum alloy parts are being completely immersed in a sodium nitrate bath. Flames are caused by oil covering on parts left from previous forming and drawing operations.

Heat Treating Problems in

THERE is really only one major problem in heat treating in the aviation industry. It is to increase the weight-strength ratio of steel, aluminum and magnesium alloys used in aircraft production. All other problems spring from this problem.

Up to now the San Diego Division of Consolidated Vultee Aircraft Corp., in common with other fabricators, has used the SAE-X4130 chrome-molybdenum alloy for most steel parts. Many standard parts are made from SAE-2330, and are heat treated by vendors and subcontractors. This standardization in the use of only two types of steel has avoided complication. Consolidated Vultee runs frequent destruction tests on parts heat treated to a tensile strength as high as 175,000 psi.

The main difficulty in connection with the use of SAE-X4130 has been the variance in chemical analysis. The variance is found in lots delivered by individual vendors and between the chrome-molybdenum stock supplied by various vendors. Increased steel production, due to the emergency, is the main reason that vendors have at times inadvertently gone outside specification limits.

To meet this problem Consolidated Vultee during the past year and a half has set up an identification system. Under the system, each lot of material

is identified as it is received in raw form from the manufacturer. The identity is maintained on the various shapes of material throughout the fabrication cycle until heat treating has been accomplished. This is done by using a combination of master control cards, heat-treat record forms, and stampings on metal.

The results include (1) supplying such information to heat-treaters that they can fulfill any heat treating requirements called for on any process card; (2) eliminating the old practice of heat treating test bars; (3) accumulating statistical data on each of the different types of steel over a full range of their specified chemical analysis; and (4) readily locating entire lots of metals which do not heat-treat satisfactorily.

At present the company is, in general, heat treating SAE-X4130 chrome-molybdenum to 175,000 psi. However, some parts designed to stand excessive strains



This small heat-treating tank is used for experimental research and tests. Here a riveted assembly is being charged into the low temperature molten salt for the purpose of aging the entire assembly. The Micromax instrument on the right records and controls the temperature of the salt solution.

are heat treated to as high as 200,000 psi. The company is anticipating the use of four new NE steels, NE 8630, NE 8635, NE 9440 and NE 9435. Sub-contractors are now heat treating these new steels to 175,000 psi with good results.

The company's heat treating of various steels is in accordance with standard practice. The part is first formed, heated to proper hardening temperature (1500 F. to 1600 F.) and held at temperature to insure homogeneous structure, and then quenched in oil. This results in an extremely hard, brittle material, which must subsequently be tempered at from 700 F to 100 F.

Considerable attention has been devoted to stainless steels. At present, Consolidated Vultee is one of the

largest users of 16-2 stainless steel in the aircraft industry as the result of considerable success in heat treating this material. The 16-2 (commercial type No. 341, formerly specification M-286) is heat treatable and is used in high-strength fittings subjected to severe corrosive conditions, and is used extensively on the Catalina (PBY-5) and Coronado (PB2Y-3), both flying boats.

Under original heat treating temperatures, this stainless steel proved to have low impact properties. The experiments of company engineers resulted in raising the specified hardening temperature from 1800 F to 1900 F. At the same time the tempering temperature was lowered from 750 F to 550 F. The new treatment showed that it was possible to obtain consistently a tensile strength above 175,000 psi with an impact strength in excess of 35 ft-lb.

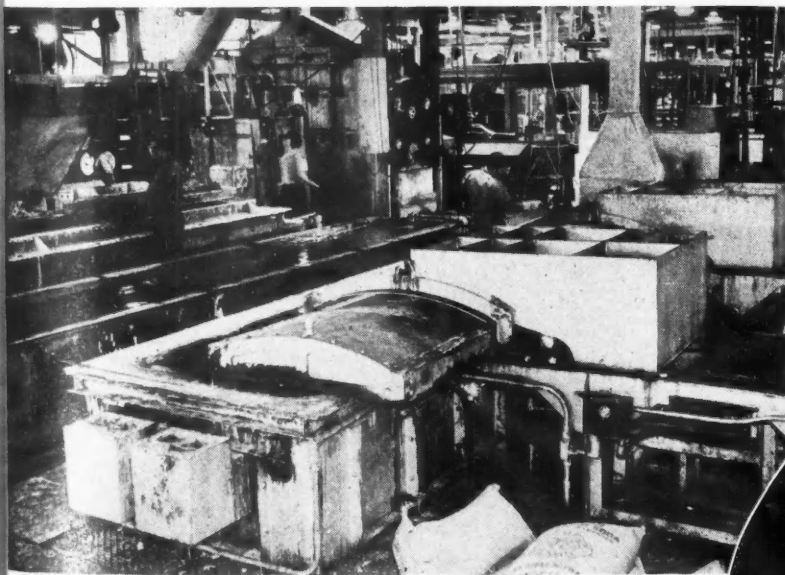
Another stainless steel problem which the aircraft industry and associated steel companies have conquered is the suitable heat treating of a material having a similar analysis to 18-8 stainless steel. The metal is being explored as a possible material for the construction of larger aircraft, and the main problems here again is gaining a high weight-strength ratio. It now offers the problem of proper joining technique.

(Turn to page 69, please)

s in Aviation

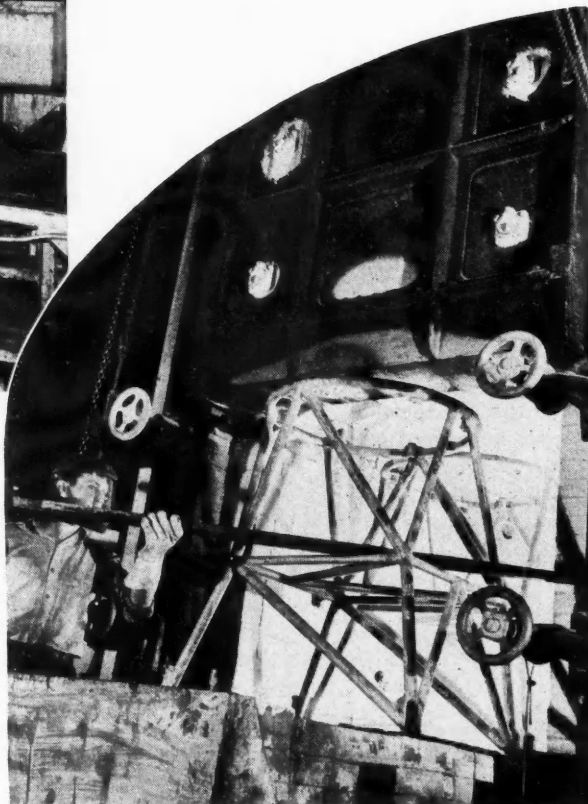
By Max E. Tatman

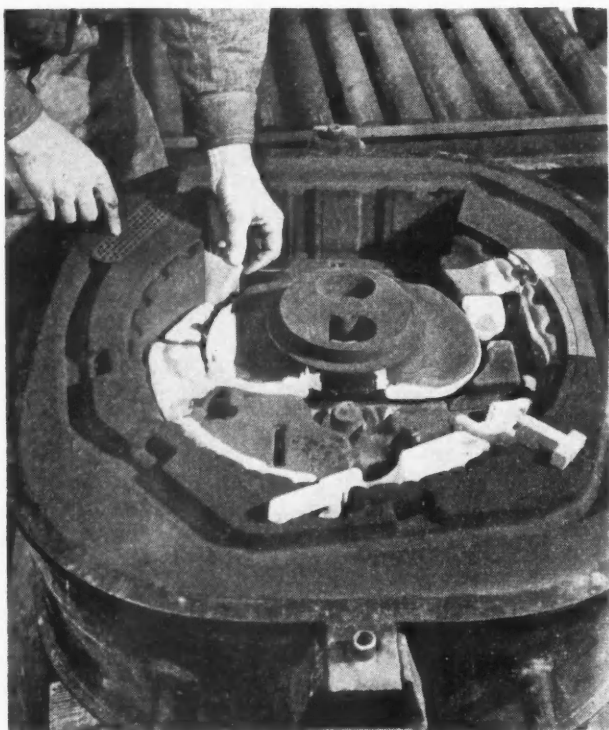
Chief Metallurgist, San Diego Division
Consolidated Vultee Aircraft Corp.



(Above) General view of the aluminum alloy and steel heat-treating department at Consolidated plant. Sodium nitrate in foreground is used to replenish the salt solution lost due to "dragout" during removal of aluminum alloy parts from the tank of molten nitrate salt.

(Right) Normalizing heat-treatment of a chrome-molybdenum engine mount which, having been subjected to a temperature of 1600F, is being removed from a gas-fired car furnace (Mahr Mfg. Co.) for the air-cool operation.





Operator assembling cores in mold. His finger is resting on one of the sand filters employed in the Chevrolet foundry.

By Joseph Geschelin

est grey iron foundry in peacetime. Mass production experience thus gained has been applied to the special problems involved in handling the volatile magnesium. It may be noted that although the management had to acquire a background on magnesium, its specialized knowledge of foundry methods—of control of pouring procedures, and the art of core-making—all have contributed to the development of one of the finest operations to be found in this country.

Generally speaking, much of the foundry equipment in the magnesium department has been borrowed from the grey iron foundry, although the melting furnaces, heat treating furnaces, pattern equipment, control laboratory, sand handling, and other items are new. According to Chevrolet experts, one of the most striking innovations in handling magnesium is their practice of pouring molds directly on a mechanized conveyor.

H-alloy magnesium, supplied by Dow Chemical Co.

Castings Poured

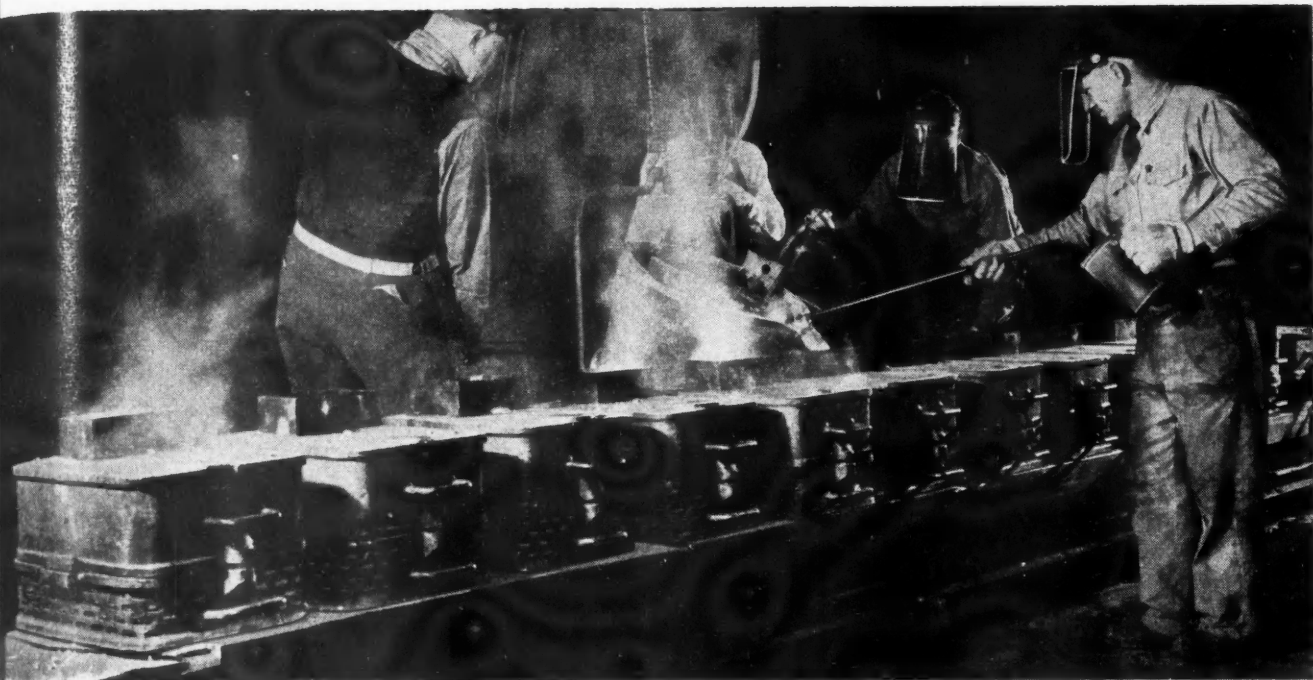
DRAWING upon its metallurgical and foundry-wise experience in operating one of the world's largest grey iron foundries, Chevrolet has expanded its war activity by converting a division of its foundry to produce magnesium castings.

At the present writing the magnesium division is producing eight castings for Chevrolet plants manufacturing Pratt & Whitney airplane engines. These parts include: an oil sump, blower housing, impeller, diffuser insert, two different rear intermediate crankcase sections, and two rear crankcase sections. As the facilities of this foundry are expanded in the near future, it will produce additional parts and may enhance its scope by serving other manufacturers.

Chevrolet's unique contribution to the art of pouring magnesium is the know-how of a foundry organization which has worked with a variety of metals, including the operation of the world's large-

Mixing core sand—a preparation composed of sand, core oil, flour, water, plus the inhibitor consisting of sulfur and boric acid.





Magnesium castings are poured on a mechanized conveyor line a portion of which is shown here. Each ladle is checked with an indicating pyrometer to assure correct pouring temperature of the metal. The operator at the right, foreground, is skimming the inhibitor on the surface of the ladle.

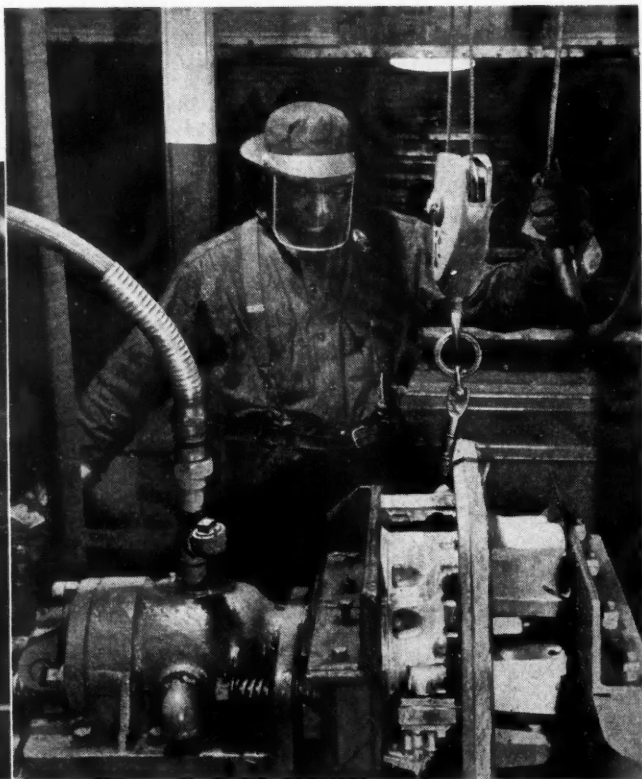
don Mechanized Conveyor

at Chevrolet Magnesium Foundry

(Lower right)

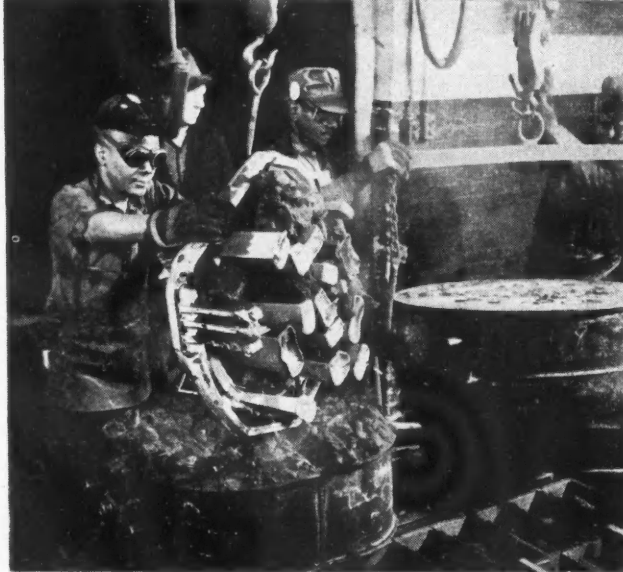
Close-up of air-driven vibrator designed and built by Chevrolet for shakeout of casting before machining. This type of vibrator is said to remove cores and molding sand rapidly and completely.

The nest of long risers is removed in one setting on a band saw. Secret of this operation is a specially-designed fixture which holds the work securely, enables a single operator to handle the operation with facility.





(Left)
Here is part of battery of oil-fired pots for superheating magnesium alloy prior to pouring.



(Below)
All heavy lifting operations are handled mechanically with the aid of hoists or cranes. Here may be seen the hoists used for disassembly of molds and removal of castings preparatory to shake-out.

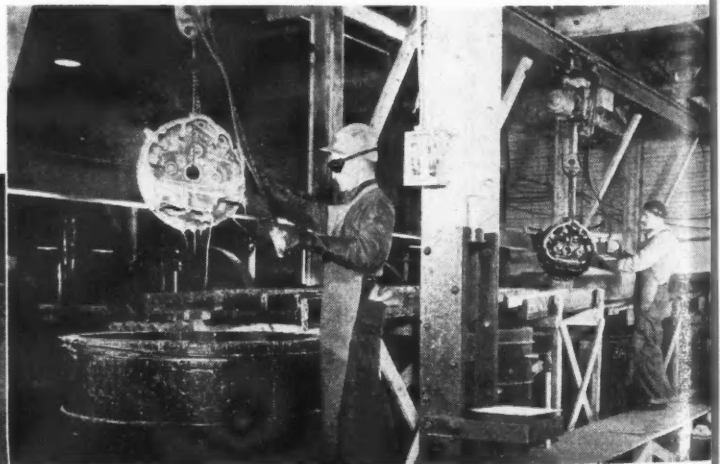
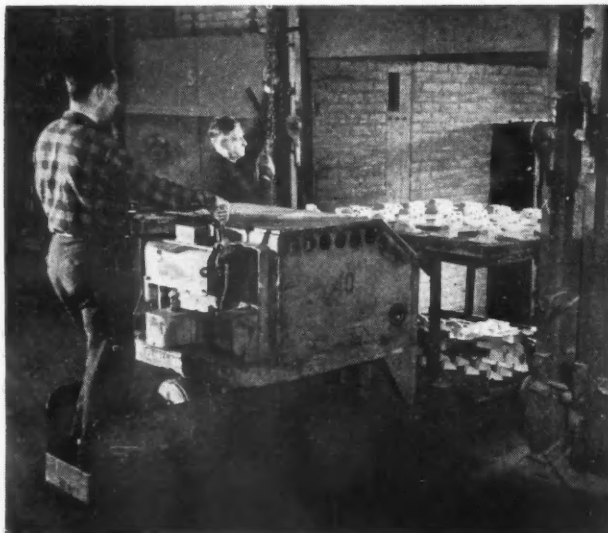
in 21-pound ingots, is melted in 2000-pound oil-fired furnaces, heated to 1250 F, then transferred to a large battery of 400-pound oil-fired pots for superheating between 1650 and 1700 F to refine the metal. Pouring temperature is predetermined, experimentally, for each type of casting and each mold is poured within the narrow range of 20 F. Molds are arranged on the mechanized pouring conveyor in such fashion that those requiring higher pouring temperatures are first in line. In each instance, the pouring ladle is fitted with a thermo-couple which is connected to an indicating thermometer dial, and the metal permitted to air-cool until the proper temperature has been attained.

Since magnesium is one of the most volatile of the metals used in modern industry, special precautions must be taken at every stage to prevent combustion and attrition

and possible fire hazard. During melting and superheating, flux is added to the surface of the metal in the pots to refine the metal and inhibit oxidation. While the molten metal is in transit to the pouring conveyor and during pouring, an inhibitor dust consisting of sulphur, ammonium fluoride, and boric acid is shaken into the ladle. Core sand also is treated with an inhibitor consisting of sulphur and boric acid.

Synthetic sand used in the operation is prepared and distributed by a newly installed, integrated, continuous sand handling equipment. The foundry sand is continually salvaged and re-used with only sufficient make-up to replace the small amount

(Turn to page 90, please)



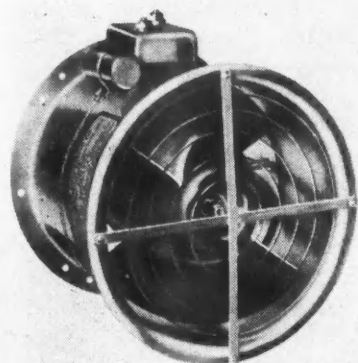
(Above)
Magnesium castings are chemically treated to prevent corrosion. This simple tank set-up handles a cycle of acid-dip, water-rinse, and dip in dichromate solution. Electric hoists mounted on an overhead rail are used for handling the work.

(Left)
Cores are baked in ovens formerly used for the cast iron foundry operation. As shown, the cores are carried on trays, transported by factory trucks.

New Products for Aircraft

Light Weight Axial Flow Fan

Dynamic Air Engineering, Inc., Los Angeles, Cal., is offering a light-weight high-pressure axial flow fan for recirculation of cabin air through gasoline combustion heaters. The unit shown, which is known as Catalog 586-B, is for use on medium and heavy bombers and light, fast boats. It has an inside



Model 586-B Axial Flow Fan

diameter of 6 in., weighs 5.7 lbs, is powered with a 1/5 hp series-wound 24-28 volt motor, and delivers 320 cfm standard air at sea level against 2 in. water gage pressure.

Recently the power has been increased to 1/2 hp and a second propeller added on a double-extended shaft (Catalog 586-SCB), to increase the volume 25 per cent at double the original pressure.

A New Blind Rivet

A new blind rivet has been developed by the Pacific Railway Equipment Company, Los Angeles, Cal. It is called the PRECO rivet, and is said to be applicable in almost any place where riveting is used and particularly adaptable for blind riveting. No special care is required as to storage, handling, or use.

The PRECO rivet consists of three parts, a steel cadmium-plated recessed head screw, either Phillips or Reed and Price, inserted into the hollow stem of a high strength aluminum alloy rivet, and a knurled nut of Dural threaded on the end of the screw. Both rivet sleeve and nut are anodized.

According to the manufacturer, the PRECO rivet is the only blind rivet which, when installed, can be reliably test-inspected. The inspector checks

with a hand screw driver and in the same manner as ordinary screw installations. It has a positive mechanical self-locking action—sheets are gripped tightly together and the expansion of the rivet sleeve fills the hole completely.

The only production installation tool necessary is a standard air, or electric screw driver. A small PRECO Adapter and Finder for the screw driver is the only accessory needed. For field or repair service, a small PRECO hand operated ratchet screw driver is available; however, in real emergencies, PRECO blind rivets can be installed with a pair of ordinary pliers and screw driver.

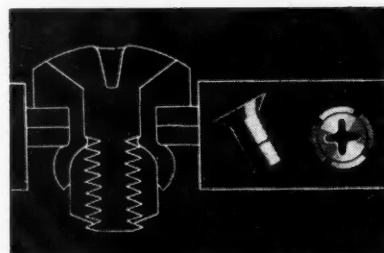
There are two types, the PRECO "Raised" Head type and the "Flush" Head type. Each type comes in three diameters—1/8 in., 5/32 in. and 3/16 in.—with grip lengths covering the normal range. All are color coded to denote grip length of rivet. The shear standard of the PRECO rivet falls within the allowable range of A D Rivets. The shear standard and other physical strength characteristics of the PRECO rivet are said to compare most favorably with standard A D Rivets.

U. S. Rubber Announces New Aircraft Mounting

A new aircraft mounting designed to protect sensitive radio equipment from vibration, is announced by United States Rubber Company, New York, N. Y.

One of the features claimed for the new mounting is its ability to absorb vibration occurring in any of three directions, an important feature when used to mount receivers, transmitters and electronic equipment.

Especially designed to meet Air Force Specifications, and known as a



Preco Rivets

"flexi-compression" type, the mounting can be made an integral part of new equipment, or readily installed to replace mountings in use. The design is such that the one mounting can be used for various loads ranging from 6 to 12 pounds, thus making possible the reduction of maintenance inventories.

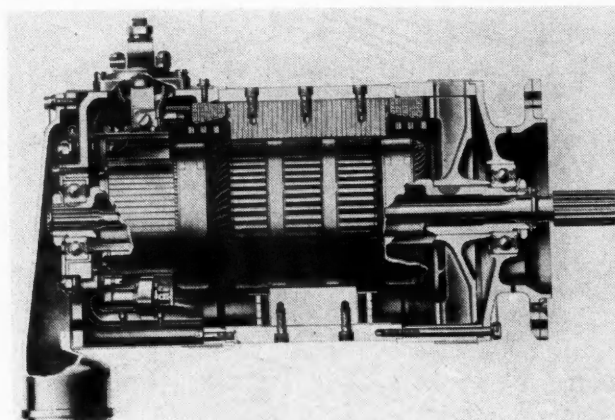
Eclipse P-2 Aviation Generator

Using the Army Air Forces P-2 Generator specifications as a basis, the Eclipse-Pioneer Division of Bendix Aviation Corporation, Teterboro, N. J., has designed a new high speed aviation generator which is suitable for both auxiliary and main engine application. The "Eclipse" P-2 generator will produce a full rated load of 200 amperes at 30 volts continuously or 6 kw over a speed range varying from less than 5000 rpm to 10,000 rpm.

To provide satisfactory operation at low cruising speeds encountered on large, long range bombers, transports and flying boats the "Eclipse" 6 kw generator delivers three quarters of its

(Turn to page 54, please)

Sectional view of
"Eclipse" P-2
High Speed Aviation
Generator.



By J. S. Haldeman

Manager of Tool Engineering,
Vega Aircraft Corp.

Design fo

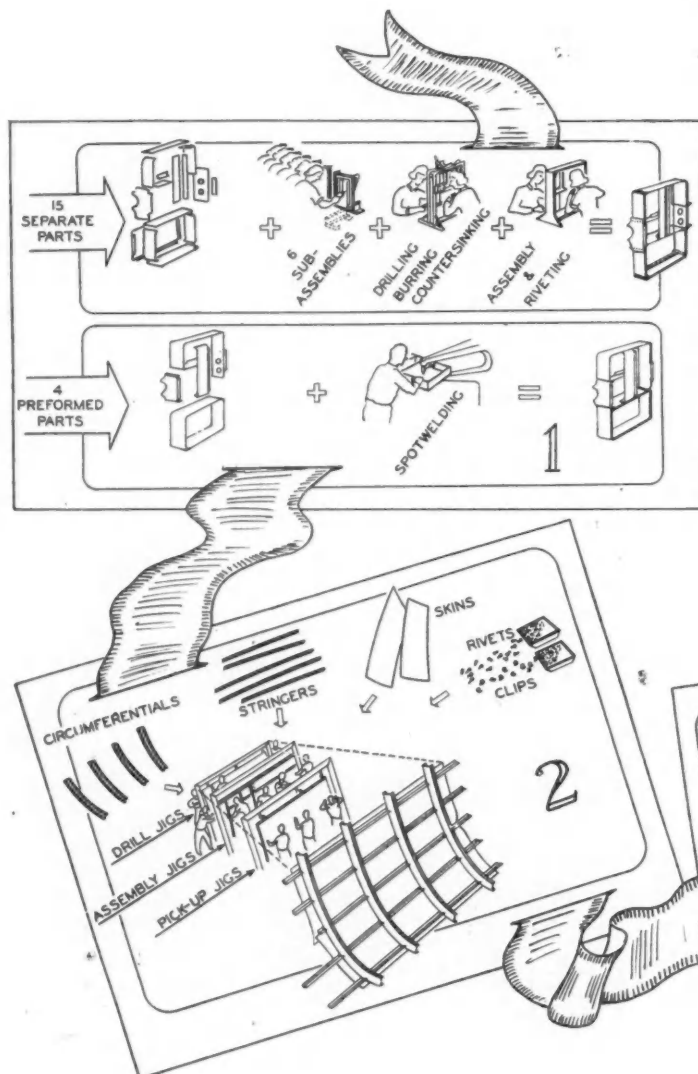
THERE are two outstanding contributions to simplify tooling and production which can be made by Design Engineers. The first is a reduction in the number of parts used in an assembly. This is illustrated in Fig. 1 showing the comparison of production methods on small assemblies. At the top you see a box comprising 15 separate parts. In the conventional method these parts are built into six sub-assemblies; each sub-assembly requiring drilling, burring, countersinking and riveting. These sub-assemblies are then combined into the final assembly, which again requires drilling, burring, countersinking and riveting to make the final part. It should also be

noted that on the 15 original parts, it was necessary to perform many operations, such as shearing, blanking, piercing and forming.

In the lower diagram, we have the same finished part. However, it was made from four parts which had been preformed, then spotwelded into the final assembly. To tooling men, a glance at this illustration clearly indicates what can be done to reduce tooling time and assembly time and costs.

To further illustrate the reduction which can be made in the number of parts in an assembly, Fig. 2 shows a conventional skin panel made up as a sub-assembly for a fuselage. This panel consists of four circumferentials or ribs, five stringers, two pieces of skin and cases, to provide drill jigs, assembly jigs, and pick-up jigs, in addition to the fabrication tooling which is necessary on each of the parts. As a comparable part, we then have the artist's conception of this same panel made from two parts (Fig. 3). A preformed inner skin and an outer skin can be riveted, in most cases by an automatic riveter, or spotwelded.

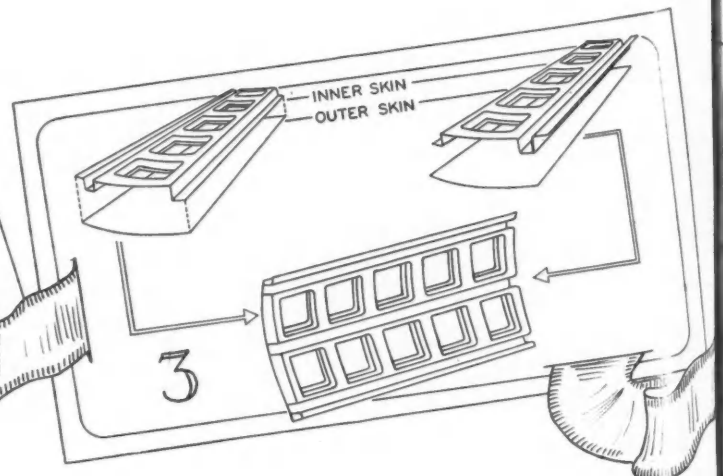
Discounting any fabrication for each detailed



1. Comparison of production methods —small assemblies.

2. Skin panel construction with stringers and circumferentials.

3. Panel assemblies with preformed skins.



for Production

part, Fig. 4 shows a diagram of the equipment and manpower required for an assembly consisting of a large number of parts against the equipment which would be used for the panel made in two parts.

The other outstanding factor to reduce tooling costs and assembly time would be a design which permits large units to be broken down into complete self-contained sub-assemblies. These sub-assemblies would lend themselves to much better working conditions through their accessibility and the more equal distribution of working areas for assembly personnel.

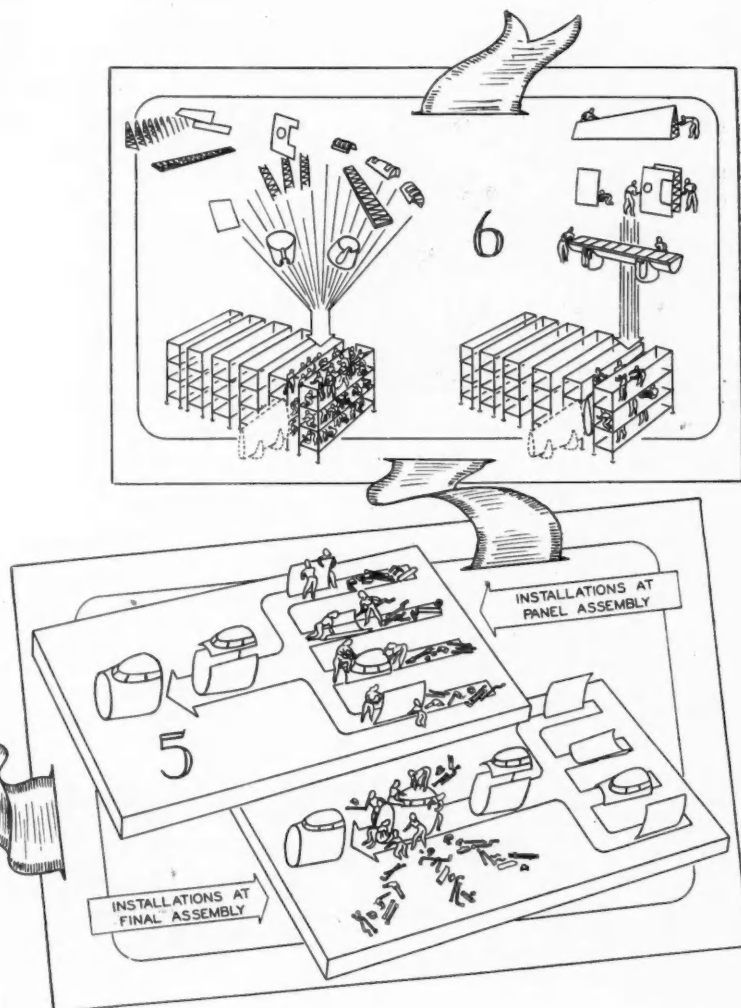
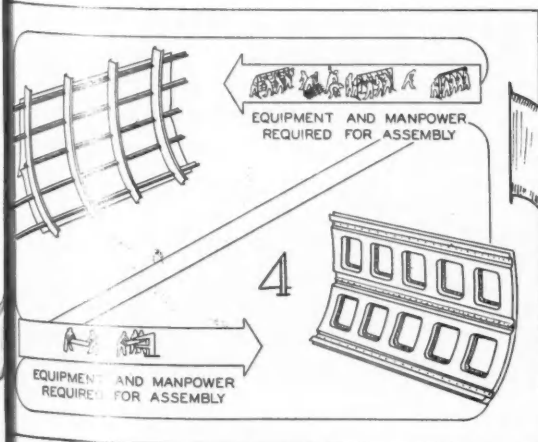
At the top of the diagram of Fig. 5 is shown a relative number of parts and personnel, working on sub-assemblies to make necessary installations, flowing into a line to make a conventional forward fuselage assembly. The lower diagram indicates a typical condition when this same number of people are required to make the same installations after the units have been joined together. It can also be shown that this method of sub-assembly is invaluable on large units, such as are shown in the diagram of a large wing assembly (Fig. 6). It can easily be noted how small parts and small

sub-assemblies, such as spars, ribs, skins, etc., flowing into a major jig, would require in that station a large number of people and a long number of man-hours in one position for the completion of such a unit. On the opposite side is an illustration of the same unit being assembled after sub-assemblies have been completed; thus, making the work in the final station a matter of just joining these major sub-assemblies. From the diagram shown, it should be understood that these sub-assemblies, spread over a larger area, permit stationizing of people, allowing them to become specialists on their individual jobs with very little effort on the part of supervision.

4. Equipment and manpower necessary for assembling skin panel made of several parts (top) and for panel of two parts (bottom).

5. Assembly of forward fuselage.

6. Comparison of assembly breakdowns — outer wing—model B-17-F.

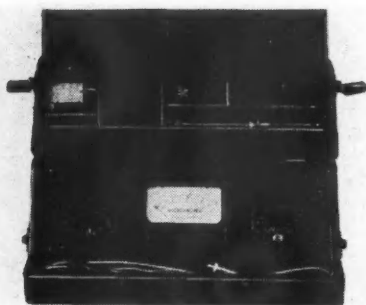


New Production Equipment

PHYSICISTS RESEARCH COMPANY, Ann Arbor, Mich., announces a new Profilometer which, like the older types, is used to provide accurate measurements of surface roughness by direct dial readings. The new instrument, known as the Type Q, is much smaller and lighter than other Profilometers. In its newly designed case are storage compartments for various Profilometer accessories which include the Type M tracer, Flexarm, glass specimen, and Type I or J tracer. Power and tracer cables are stored in a compartment in front of the panel.

The meter panel, now set at a 45 degree angle, permits easy reading of the meter. Where it was formerly necessary for the operator to stand above the instrument to take readings, the Profilometer can now be used while the operator is seated.

One of the most important changes



Type Q Profilometer

made is in the calibration of Profilometer tracers. Now they are all adjusted to the same calibration number so that adjustment of the amplifier in the field is no longer required. This makes possible fewer instrument controls and is said to eliminate the possibility of calibration errors on the part of the operator. The Type Q Profilometer is designed for use on 115 or 230 volts 50-60 cycle power lines.

In operation, the new instrument performs the same function as other Profilometers. By simply moving a tracer, either manually or automatically over surfaces of practically any size, shape, or degree of roughness, the information required is indicated immediately in true inch units on the instrument dial. No computations or other scaling methods are necessary.



Sheffield Electrichek

FOR bench type production inspection, the Sheffield Electrichek, which is being offered by the Sheffield Corporation, Dayton, Ohio, provides unusual advantages for checking close tolerances accurately and economically. It is a limit type comparator which eliminates the element of human error and instantly determines and indicates by signals whether the work part dimension is within tolerance. A red light shows undersize, a green light oversize and an amber light for within tolerance. This gage is widely used for production inspection, and is extremely fast.

The maker states that new and untrained workers, in fact anyone who can distinguish the colors of red, green and amber, can operate this gage in which electricity and mechanical movement replace the need of skilled operators. The mental and physical condition of the worker do not affect the accuracy of the electric gage. All the operator has to do is watch the signal lights and distinguish between red, green and amber. In cases of color

blindness, defective vision or other special conditions, it is possible to use bells and buzzers as signals instead of lights. The gage has a vertical adjustable capacity 0-in. to 6 3/4 in. and column to gaging point throat capacity of 3 3/4 in. It has an adjustable range equivalent to 12 snap gages.

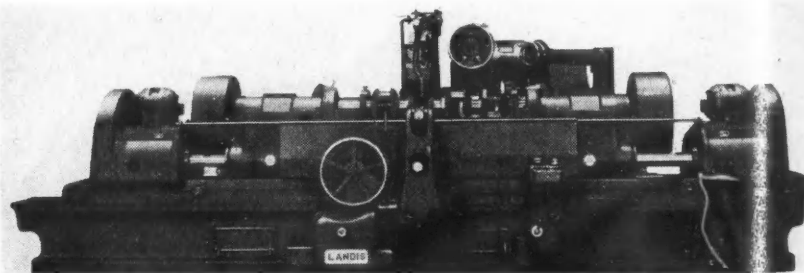
Another advantage of the electric gage is the fact it is always available for instant use when needed. Electrichek employs the well known frictionless reed mechanism and there is practically nothing to wear out.

LAATEST addition to the line of precision grinding machines manufactured by the Landis Tool Company, Waynesboro, Pa., is the new Landis 25-in. Type DD Hydraulic Crank Pin Grinder. In the shorter lengths, it is recommended for both single and double throw radial engine crankshafts, and for in-line liquid cooled engine crankshafts. Smaller Diesel engine shafts may be handled by the longer machines.

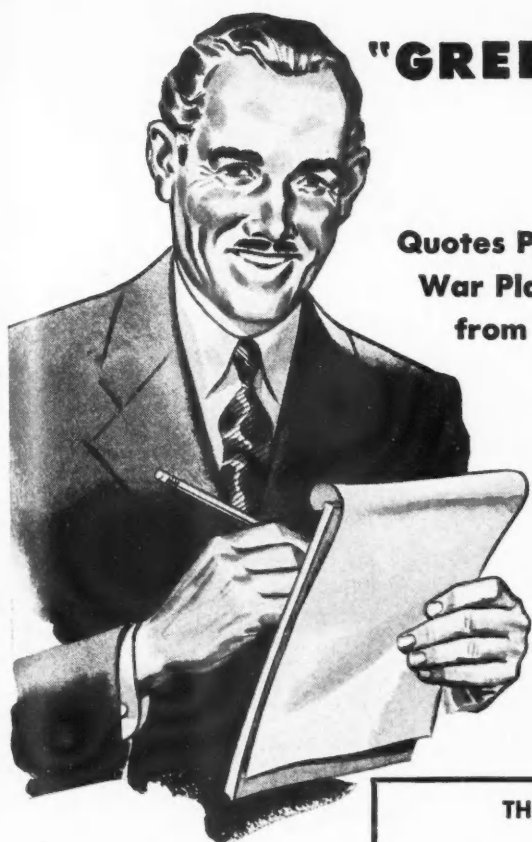
One of the principal features is the dual work drive arrangement which is said to eliminate or minimize objectional axial work deflection in the crankshaft. The speed of the two work drive motors is synchronized electrically. All multiple V-belt drive speed reduction units at each end of the table are coupled by a large diameter drive shaft, the drive from which is through chains and sprockets to the two work spindles. Both work heads may be moved transversely on top of the work table to permit the handling of shafts of varying lengths by the same machine.

Two balancing weights, which may be moved radially in a T-slot in the circular plate at the end of each work spindle, compensate for any out-of-

(Turn to page 80, please)



Landis 25-in. Type DD Hydraulic Crank Pin Grinder



"GREEN HANDS FROM SCHOOLS COULDN'T BURN TOOLS"

Quotes POR-OS-WAY'S
War Plant Reporter
from Interview

Dear Charlie:
I'm at the ~~factory~~ plant where they're using Por-os-way wheels to grind carbide-tipped tools free hand and dry. Even here they've boosted production over 40% and in their own words "green hands from training schools couldn't burn tools." In fact, they said the tools "hardly get warm". Cool action is the big thing in grinding carbide tools.
Be seeing you.
Your roving reporter
Vic

THE JOB:

Grinding free hand and dry on Excello Tool Grinder carbide-tipped tools 1" x 1" x 6", for turning air-plane struts, shaping air-plane carburetors, shaping and turning gun turrets for planes.

THE WHEEL: Por-os-way 10" x 2" x 2" C54KV3

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent

See our exhibit booth at Room 777, Palmer House, National Metal Congress, week October 18.

THE RECORD	POR-OS-WAY WHEEL	FORMER WHEEL
Number tools per hour per man	37	26
Number of dressings required	NONE	Every 2 hours
Pieces per wheel	888	520
Stock to be removed	.000"—.250"	same
Wheel life	24 hours	20 hours
Depth of cut	.002"—.010"	Tools burned when jammed into wheel
Number of passes required	12	48
Amount of rejects	0	50 per day (scrapped)
Increase in production	42.3%	

WRITE, for complete booklet "Facts About Por-os-way". The address is 466 Wheatland Street, Phoenixville, Pennsylvania.

**2 TO 5 TIMES
MORE WAR PRODUCTION
PER MAN PER MACHINE**

POR-OS-WAY*
a new
RADIAC* PRODUCT

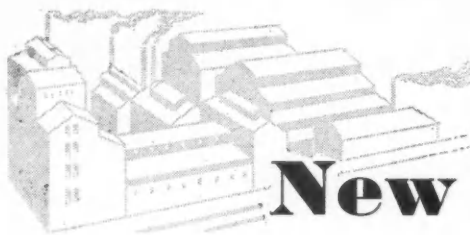
A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH,
CLEVELAND, DETROIT, LOS ANGELES



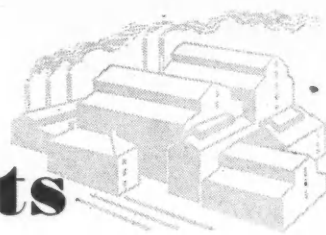
PHOENIXVILLE, PENNA.
Western Gateway to
VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.
COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.





New Products



Oil for Low Speed Diesel Engines

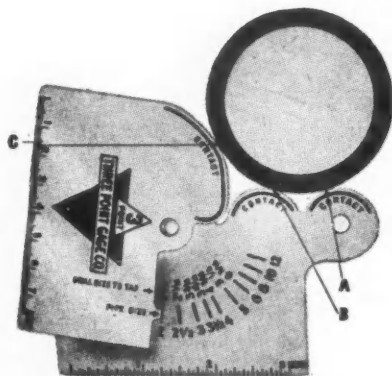
Development of a new detergent type lubricating oil which is said to reduce wear and assure engine cleanness and oil stability for low speed Diesel engines is announced by Standard Oil Company of Indiana.

Many engines give clean operation with conventional oils, but where dirty operation cannot be corrected by mechanical adjustment, the new detergent type lubricating oil can be used, according to Standard Oil engineers. The new oil will thus prevent ring-sticking, piston scuffing and excessive sludge and gum deposits. The detergency results from the use of an additive which is both a detergent and an oxidation inhibitor.

Three Point Pipe Gage

The Three Point Gage Company, Chicago, Ill., is introducing a pocket size Three Point Pipe Gage for instantaneous measurement of all sizes of pipe from $\frac{1}{8}$ in. to 12 in. This gage consists of two pivoted steel plates with edges curved at three points for contact with the pipe to be measured, together with scale which automatically registers not only the pipe size in terms of inside diameter but the drill size for tapping. The gage measures by the method of determining the outside arc of the pipe at three points of contact.

An advantage claimed for this new gage is that it is necessary to contact only a small section of the pipe contour and that it will measure pipe in any position, even against the wall or



Three Point Pipe Gage showing contact with pipe at A, B and C

in a corner, and will measure a covered pipe if there is a small opening near a union or other fitting where the gage may be slipped in. The gage can be applied in dark places and taken to the light for reading. The device is constructed of steel with deep etched numerals, and the size when closed is $2\frac{1}{2}$ in. by $4\frac{1}{4}$ in.

Small Stove Heats Engine Coolant

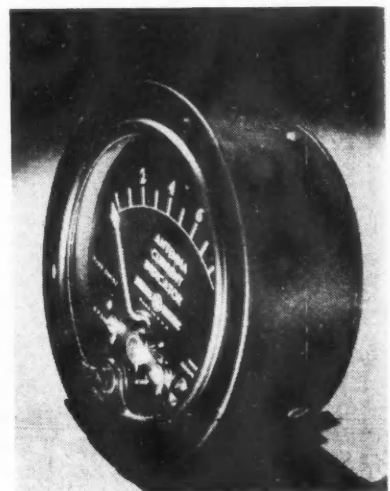
To insure instant starting of Army vehicles, such as jeeps, trucks, and half-tracks, The Texas Company, New York, N. Y., has designed a small gasoline stove no larger than an ordinary passenger car hot-water heater. The device is now being installed in Army motorized equipment for use during the coming winter. It operates 24 hours or more without attention, does not consume electrical energy, and is adaptable to a wide variety of vehicles.

The stove, which heats the engine coolant and burns only about a gallon of fuel in 24 hours, is built to Texaco engineer's specifications by the Perfection Stove Company.

Panel Instruments With Internal Pivots

A new line of small, thin, d-c panel instruments, featuring an internal-pivot construction, has been developed by the General Electric Company, Schenectady, N. Y., for use in aircraft, and radio and communications equipment, and for application on various types of machinery. Available with either brass or molded Textolite dust-proof and moisture-resisting cases in $2\frac{1}{2}$ -in. sizes, the line consists of d-c voltmeters, ammeters, milliammeters, microammeters, radio-frequency ammeters and milliammeters, and d-c voltmeters. The volt-ammeter, one of the group designed for naval aircraft, has a push-button-operated switch to change the reading from "amperes" to "volts."

In the new instruments, the pivots are solidly mounted on the inside of the armature shell instead of being secured to the outside of the armature winding in the conventional manner. One jewel bearing is mounted rigidly on top of the core-and-frame assembly, and the other is mounted in an adjustable sleeve fitted into the lower part of the soft-iron core. Thus the element assembly is a single, self-contained



G-E "Internal-Pivot" panel instrument

unit, all parts of which are supported by a high-coercive cast magnet, and it can be removed easily for inspection or repair in the field.

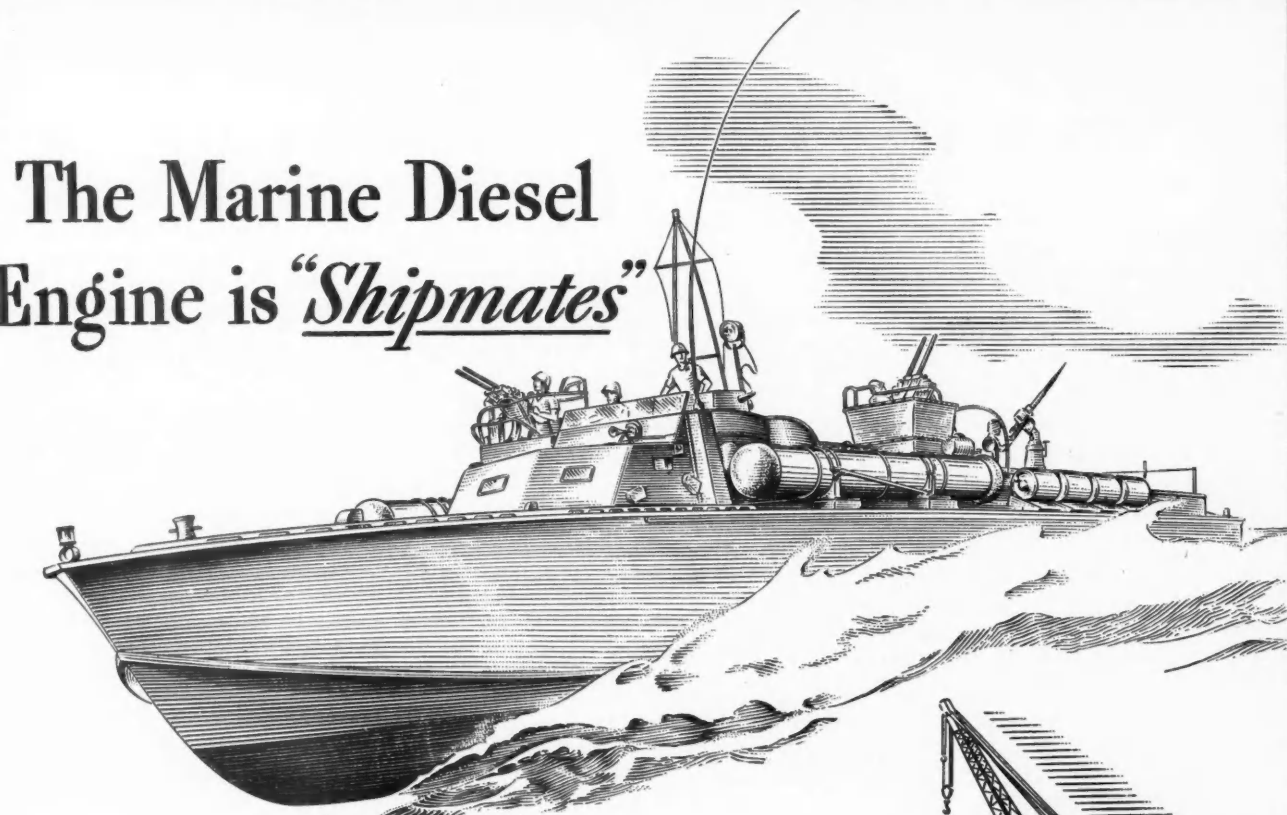
This unique design is said to enhance the sturdiness of the instruments and also render them excellent for applications where vibration is present. In addition, the combination of high torque and a lightweight moving element results in a fast response, and good damping makes for ease and accuracy of reading. The instruments will operate satisfactorily in temperatures ranging from -50°C to 70°C , and are accurate to within the limits of ± 2 per cent of full-scale value.

Marvinol, a New Elasto-Plastic

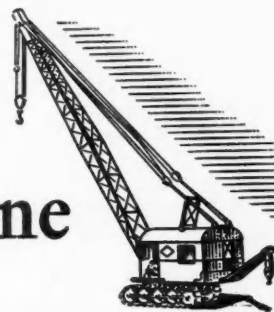
A new elasto-plastic, known as Marvinol, has just been announced by The Glenn L. Martin Company, Baltimore, Md. Marvinol is not a synthetic rubber, according to the maker, but a completely new material which is better suited for many of the purposes for which rubber had previously been used than rubber itself, as well as bridging many gaps not hitherto filled by the synthetic rubbers. The new substance is actually a vinyl-type plastic and, in common with the vinyl plastics, Marvinol has properties of reclaimability due to its thermoplastic nature, superior abrasion resistance, ability to withstand constant flexing without fatigue,

(Turn to page 62, please)

The Marine Diesel Engine is "Shipmates"



...with a Dragline Crane



YOU MIGHT WONDER at the connection between a Marine Diesel engine and a dragline crane. The crane's is a back-breaking job in all kinds of weather, and maintenance must be taken with a grain of salt. Knowing this, crane companies wisely choose the Torrington Needle Bearing, famed for high load capacity, efficient lubrication and minimum service attention required.

Now the Marine Diesel engine is something else again—a miracle of compact engineering design that's got to be so thoroughly dependable...so all-fired ready at the bark of a command that selection of even small parts becomes a major consideration. So the Marine Diesel designers, too, specified the Needle Bearing—for its small size and reliable performance. But they discovered some other features that were right "on target," although hardly expected in a bearing.

The low starting friction of this unique anti-friction bearing, for example, meant quicker engine response, and maybe sub and PT-boat crews don't appreciate that. High load capacity helped prevent overloading, keeping more ships in fighting trim more of the

time. The Needle Bearing's light weight saved pounds on board for fuel and ammunition, while its ready availability for essential applications enabled engine builders to go ahead on the

Marine Diesel production that helped turn the tide in the battle of the Atlantic.

HAS THIS GIVEN YOU AN IDEA for your post-war designs? You may find the answer to one of your problems in the Needle Bearing's unique combination of features. For these are what your customers have been educated by war's developments to want in the peacetime products they plan to buy. Light weight, compact design, ease of installation, infrequent maintenance, long life—here are Tomorrow's sales points, and they add up to the Needle Bearing. Let a Torrington engineer show you how you can adapt the Needle Bearing's advantages to your product's design. For preliminary information, send for Catalog No. 107 which lists sizes, types and ratings, together with a list of typical applications.

NEEDLE BEARINGS—ALL TYPES—ALL SIZES

NEEDLE BEARINGS TYPE DC are complete, self-contained units consisting of a full complement of rollers and a drawn, hardened outer race. They offer the advantages of small size, low cost, high capacity—and easy installation.



NEEDLE BEARINGS TYPE NCS consist of a full complement of rollers and a relatively heavy hardened outer race. They are furnished with or without inner races. Needle Bearings Type NCS are adaptable to heavier loads than Needle Bearings Type DC.

NEEDLE ROLLERS TYPE LN

are produced in a range of types and sizes for assembly on the job into low-cost, high-capacity, anti-friction bearing units. Our engineering department will be glad to advise on the correct size and type for any application.



THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.
Makers of Needle Bearings and Needle Bearing Rollers

New York	Boston	Philadelphia
Detroit	Cleveland	Seattle
San Francisco	Chicago	Los Angeles
Toronto		London, England



TORRINGTON NEEDLE BEARINGS

Tank Production Program Down About One-Third in Dollar Volume

Cadillac, Chrysler and Fisher Body Only Light and Medium Tank Producers in Automotive Field

Chrysler, Fisher Body and Cadillac remain the only automotive manufacturers in production on light and medium tanks as the result of major changes in the Army's tank program which have cut back output approximately 40 per cent in the last six or seven months. Ford is the chief automobile manufacturer withdrawing from the tank field but the company will continue to make 12-cylinder liquid-cooled tank engines at the Lincoln plant and tank armor plate at the new plate mill in the Rouge plant. The tank final assembly space at the Highland Park plant will be used for the manufacture of other war products, including bomber sub-assemblies and aircraft engine parts. The gear grinding department of the Pratt & Whitney 2000-hp engine manufacturing job is being moved from the aircraft building at the Rouge to Highland Park in line with the expanded aircraft engine program. This will permit the extension of the aircraft engine final assembly line the entire length of the Rouge aircraft building. Ford has been manufacturing M-4 medium tanks and M-10 destroyers on two final assembly lines at the Highland Park plant for more than a year. The tanks were broken in on a nearby test track. A number of other locomotive and railroad car companies also are withdrawing from the tank program to concentrate on rail equipment for lend-lease and domestic use.

The U. S. tank production program has been cut back approximately one-third in dollar volume this year, according to Maj.-Gen. L. D. Clay, director of materiel for the Army Service Forces. The reduction in 1944 output will be approximately 50 per cent from the original schedules set two years ago but the total still will be slightly ahead of 1943. Russia cancelled orders for between 5000 and 6000 medium tanks last spring due to a pressing need for trucks and locomotives that would take up the limited shipping space and port facilities. Later, some of the Russian cancellations were reinstated. There also has been a wholesale reduction in British orders. In contrast, U. S. tank requirements have been cut back only 10 per cent. All

U. S. armored divisions are now completely equipped with medium tanks. Despite cutbacks, the U. S. produced 23,000 tanks in the first eight months of 1943, according to President Roosevelt's report to Congress.

The tank building capacity of Chrysler for M-4s, Fisher Body for M-4s and M-10s and Cadillac for M-5 light tanks and 75-mm howitzer motor gun carriages presumably will be used to replace combat losses and to equip new armored divisions, as well as for reduced shipments under lend-lease. An

indication of battle losses was revealed recently by Henry Morgenthau, Jr., Secretary of the Treasury, when he said that losses in the Sicilian campaign totaled 36 per cent of the Cadillac-built 75-mm self-propelled howitzers, 7 per cent of the M-5 light tanks and 8 per cent of the medium tanks participating in the invasion. Losses of M-6 37-mm motor gun carriages built by Dodge totaled 54 per cent of the number involved.

President Roosevelt reported to Congress that in the first eight months of 1943 the U. S. produced 52,000 airplanes, 23,000 tanks, 40,600 artillery weapons, 4,638,000 small arms, rifles, carbines and machine guns and 13,339,000 rounds of small arms ammunition. From the start of the defense program in May, 1940, to Sept. 1, 1943, this country turned out 123,000 air-

(Turn to page 176, please)

Steel Making Material Supply Is Again a Problem for Producers

Iron Ore Shipments Not Up to Expectations; Scrap Drive Yield Assumes New Importance

By W. C. Hirsch

Steel production continues at close to rated capacity with the flow of shipments to war material plants progressively calling for less and less prodding by expeditors. With the expected easing off in the need of plates as the result of the advance in shipbuilding programs, more rolling mill capacity for the production of sheets is likely to be available, increasing thereby the supply of cold-rolled sheets, which of late has been relatively tight. It is hard to say whether recent developments in the European theater of war prompted a switch-over in the steel market to the impression that, for the next six months at least, no change in the Government's war requirements need be looked for, but this view seems to be predominant today while not so long ago the possibility of the effect of sudden changes in the war's progress on the steel industry was emphasized much more strongly. Adequacy of the supply of steel-making material is once more the problem, occupying the center of the stage.

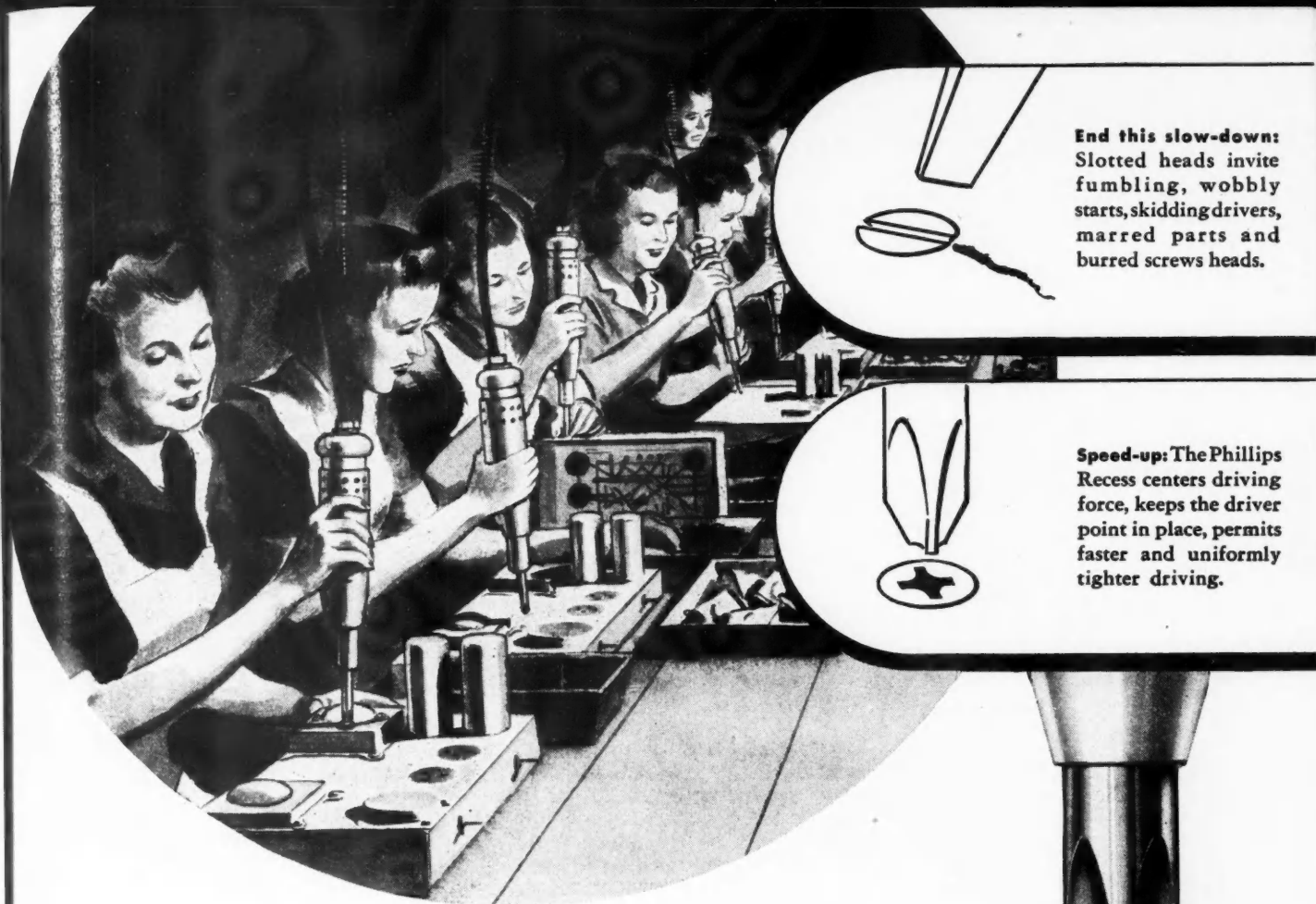
Iron ore shipments from upper Lake ports have not come up to expectations, and there is again much dependency

on the yield of the scrap drive, which is scheduled to last from October 1 to Nov. 15. Through closer co-operation with scrap iron dealers, better results than in previous drives are hoped for. Scrap accumulation depositories, convenient to dealers' yards and equipment, are to be established, and it may be that this will eventually lead to adoption of the scrap collecting method followed in Great Britain, where they do not rely upon periodical drives, but upon the public seeing to what extent scrap accumulations are being eaten into, and then replenishing them before the situation becomes critical. Upward adjustments in scrap ceiling prices are hoped for by dealers as an incentive to the bringing out of increased tonnages.

In order to reduce the number of sections and sizes of hot rolled carbon bars to a minimum, steel mills have been directed by a recent WPB order to comply with a new schedule, which effects a reduction of 40 per cent in the variety of sizes and is expected to permit an increase of 10 per cent in production and release some facilities for other purposes.

WPB Copper Division has put into

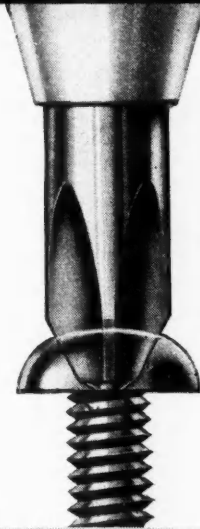
(Turn to page 178, please)



End this slow-down:
Slotted heads invite fumbling, wobbly starts, skidding drivers, marred parts and burred screws heads.



Speed-up: The Phillips Recess centers driving force, keeps the driver point in place, permits faster and uniformly tighter driving.



Capture EXTRA PRODUCTION with Your Screw Driving Army

PHILLIPS SCREWS DRIVE TWICE AS FAST

Don't just *worry* about lagging production... *do something* about it! Boost your output by providing your assembly line with Phillips Screws — the modern speed-screw with the scientifically engineered Recessed Head! The Phillips driver automatically centers in the screw head, utilizes turning power rather than head-on pressure, eliminates the troubles that slow-up driving... wobbles, skids, burred screw heads. The result is speedier assembly... as much as 50% in some plants.

The skid-proof feature of the Phillips Recess further prevents marred parts and driver-slashed hands. Freed from fear, old timers and newcomers alike can concentrate on fast, faultless driving. Power and spiral drivers can be used to advantage. Switch to Phillips Screws and see how your screw driving army chalks up new assembly records.

Compare the cost of driving Phillips versus slotted head screws. You'll find that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting — Driver point automatically centers in the recess... fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving — Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving — Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings — Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.



PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
The H. M. Harper Co., Chicago, Ill.

International Screw Co., Detroit, Mich.
The Lamsen & Sessons Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.

Phell Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdell & Ward Belt & Nut Co., Port Chester, N. Y.
Sevill Manufacturing Co., Waterville, Conn.
Sheeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

GM Re-emphasizes Demands For Incentive Pay Methods

**Murray Corp. Has Been Successful in Adopting an
Incentive Wage Agreement at Its Ecorse Plant**

Incentive pay as a means of increasing production without adding more employees and giving workers more income without violating government wage ceilings has been included among the bargaining demands of General Motors Corp. in its current negotiations with the UAW-CIO over renewal of the contract which expires Oct. 5. Among the 16 GM demands, probably the most challenging is No. 15, which reads: "That the union withdraw its opposition and lend its support to individual piecework or other incentive method of pay when it has been determined by the management that the introduction of such incentive pay will increase the production of war materials. Any change in the wage payment plans will be negotiated with the shop committee before being placed in effect. The corporation is satisfied that the introduction of incentive pay will increase war production from 10 to 25 per cent without increase of manpower."

Walter P. Reuther, head of the GM Dept. of the UAW-CIO, is unalterably opposed to incentive pay. Another faction of the union, headed by Richard Frankenstein, director of the union's aircraft division, has shown some disposition to regard incentive pay favorably as a means of getting increased income for workers.

Commenting on the incentive pay proposal, C. E. Wilson, president of GM, said recently, "If proper incentives can be worked out, we would like to try them in a number of our plants. That's the only way I see to give men more pay. There's nothing inflationary about paying a man more for doing more work. There's nothing basically anti-union about incentive pay. But there's some difficulty in getting UAW leaders to reverse their position, which has been against incentive pay from the start. There are two prime requisites of incentive pay systems which never should be forgotten. They are never to set a standard without proper time study and never let anybody cut the standard once it is set."

It is difficult to set fair and equitable standards in modern mass production, where a number of jobs are interdependent. However, Murray Corp. of America has been notably successful in adopting an incentive wage agreement in cooperation with Local 2 of the UAW-CIO at its Ecorse, Mich., plant. This plan, which became effective last June 18, has proved satisfactory to both management and the union. The plan really had its foundation several years ago when Murray Corp. gave a thorough time study training course to certain qualified union members who now serve as time study stewards. The

Murray plan offers a guaranteed base rate for all workers for the hours they actually work and guaranteed standards regardless of how high employee earnings rise. No standard can be changed unless there is a change in method, equipment or quality, or work is added or reduced.

Standards are established to permit the average operator to perform at 100 per cent at a normal non-incentive pace and, when working at an incentive pace, to earn at least 18 per cent in excess of standards over an entire shift period. A copy of the Murray time study procedure manual is given to each employee and every worker has a right to challenge the standards through appeal to the union time study stewards. Incentives are established on an individual basis whenever possible. Any serious breakdown or stoppage of greater duration than provided for in the standard is allowed and paid for at the base rate. If the company fails to apply a standard on a productive operation within 15 days, the worker receives a 7 per cent allowance until a standard is established. After new employees have worked at 100 per cent or better for a week, they are raised from the starting rate to the experienced hourly rate.

Non-productive as well as production workers share in the Murray wage incentive plan. Stock crib attendants, crane operators, stock handlers, electric truck operators and similar employees receive one-half of the combined weekly performance in excess of 100 per cent for the departments they serve. They also receive 5 per cent when their weekly base wage is equal to or less than the established non-productive standard and 1/2 of 1 per cent for each per cent saved on the established weekly non-productive standard. Similar arrangements are in effect for die setters and inspectors. Sweepers and rivet sorters are paid one-half of the total weekly plant performance in excess of 100 per cent. Non-productive standards are posted weekly on plant bulletin boards. The plan is in effect until Jan. 1, 1944, and will continue yearly unless move to amend it is made 30 days prior to that date.

Detroit is confronted with a manpower crisis, according to a recent report by M. A. Clark, Michigan director of the WMC. This shows that employment in 67 major war plants in the Detroit area has increased from 452,000 June 1, 1941, to 710,000 on Sept. 1, 1943, a 57 per cent gain in 2 1/4 years. Totals for these 67 plants call for employment of 772,500 by Jan. 1, 1944. Eighty-two thousand more workers for all Detroit war plants must be found

in the next three months, of which 12,000 must be men due to the nature of the jobs involved.

"Our reserve pool of male labor is exhausted," reported Clark. "The Detroit offices of the USES now have 23,400 unfilled orders for workers. During a recent week the USES placed more than 5100 workers in new jobs but the number of unfilled orders continues to increase. There are critical shortages of common labor which are holding down production of foundry and forge shop materials. In-migrant labor, upon which Detroit has depended largely in part, is arriving in steadily decreasing numbers. States such as Kentucky and Tennessee, which formerly had large surpluses of labor, no longer have these reserves to send. The number of Negro in-migrants, especially women, is dropping sharply."

Clark is counting upon the addition of 70,000 women workers to avert a manpower shortage in the Detroit area. As of July 1, 26 per cent of the 719,800 employees in Detroit war plants were women. Only 12 per cent of total employment was women, May 1, 1942, 14 months before. However, by next Jan. 1 the percentage of women may rise to 32 per cent. In the 14 months from May, 1942, to July, 1943, total employ-

(Turn to page 88, please)

National Security Award

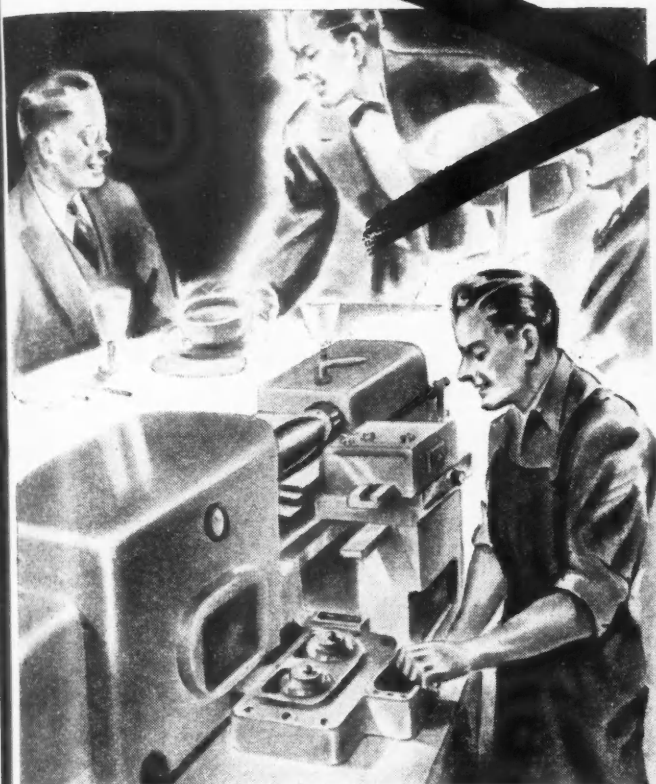
The United States Office of Civilian Defense is establishing the National Security Award to recognize those industrial plants which have developed superior safeguards against fire, sabotage, accidents or possible air attack.

All industrial plants and related establishments, including those assigned to the continuing protection responsi-



bility of the War and Navy Departments, are eligible for OCD's National Security Award. The relative size of the plant is not a factor in granting the award, which will be made to individual plants and not to a company or cooperation for all its establishments.

The award will be granted by the OCD Regional Director in the name of the Director of the U. S. Office of Civilian Defense, with the concurrence of the appropriate State Council



QUICKER PRODUCTION from UNSKILLED HELP

Assured by
VICKERS
HYDROMOTIVE
CONTROLS

The war cannot wait on long training programs . . . workers to fill manpower shortages must be trained quickly so they can turn out needed production at the earliest possible moment.

Machines equipped with Vickers Hydromotive Controls shorten and simplify training. Most of the required skill can be built into the machine. Complex operations can be reduced to simple routines . . . or can be made automatic. Controls can be interlocked so the job can't be done wrong. Overload and tool breakage can be prevented by exact load limitations which are easily applied.

A Vickers Application Engineer will gladly discuss "hydraulics" in connection with your machines.

Representative of More than
 5,000 Standardized Vickers Units
 for Every Hydraulic Power
 and Control Function

VICKERS Incorporated

1428 OAKMAN BLVD. • DETROIT, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT
 LOS ANGELES • NEWARK • PHILADELPHIA • ROCKFORD • TULSA • WORCESTER



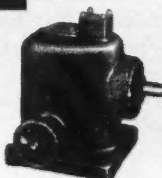
CONSTANT DELIVERY
PUMPS



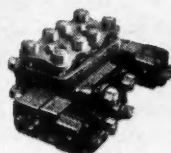
CONTROL
ASSEMBLIES



FLUID MOTORS



VARIABLE DELIVERY
PUMPS



DIRECTIONAL
CONTROLS



PRESSURE
CONTROLS



VOLUME
CONTROLS

War Plant Expansions

Studebaker Corp. has been granted an increase of \$5,500,000 in its contract with Defense Plant Corp. for additional war production facilities in Indiana and Illinois, bringing the total commitment on aircraft engine facilities to \$93,000,000. General Motors Corp. has received a boost of \$5,000,000 for additional machinery at plants in Michigan and Indiana, upping the total to \$72,000,000. GM also has received an increase of \$115,000 in another contract for facilities at Indiana plants, making a total of \$1,000,000.

Wright Aeronautical Corp. has received a \$5,500,000 increase for additional equipment for plants in New Jersey, raising the total commitment to

\$45,000,000. Boeing Aircraft Co. has been granted a DPC increase of \$650,000 for additional facilities in Washington, making the total \$1,150,000. Douglas Aircraft Co., Inc., has been awarded a \$250,000 increase for additional California plant facilities and Fairchild Airplane & Engine Corp. has been allocated \$115,000 more for equipment at a plant in North Carolina, upping the total to \$3,900,000.

Aircraft Products, Inc., Detroit, has received a \$550,000 contract for facilities in Tennessee. Bower Rolling Bearing Co., Detroit, has been awarded \$165,000 for additional equipment at a Michigan plant and N. A. Woodworth Co., Ferndale, Mich., has had its contract raised by \$110,000 to \$4,250,000 for additional equipment at Ferndale.

The Tax Axe, the Goose and the Golden Eggs



"It is only under conditions of a free enterprise system that substantial advancement has been made in the elevation of living standards and the spread of security to a substantial number of nation's population.

"But enterprise is not free if it is subjected to excessive regulation and oppressive taxation. Unwise regulation is a powerful brake on productive forces, but excessive taxation locks the wheels.

"Only a policy of moderate taxation will insure a full release of the driving power of private initiative and private enterprise."—Tax Foundation.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE AND AVIATION INDUSTRIES

Business activity as a whole, showing only minor fluctuations, continues the advance maintained since July, 1942. The seasonally adjusted index of *The New York Times* for the week ended Sept. 11 stands at 143.6, a new peak, as against 140.8 a week earlier and 132.1 a year ago.

Retail trade has been sharply enlivened with the coming of early autumn weather. Department store sales reported by the Federal Reserve Board for the week ended Sept. 11 were 10 per cent larger than in the corresponding period last year. This compares with a gain of 1 per cent reported a week earlier. Sales for the four weeks ended Sept. 11 were 6 per cent above the figure a year ago.

Railway freight loadings during the week ended Sept. 11, reflecting holiday influence, totaled 834,671 cars, 7.4 per cent fewer than in the preceding week but 2.4 per cent greater than the comparable number in 1942.

Electric power production computed on a daily basis increased in the same period and was 18.0 per cent larger than in the like period last year. The comparable gain reported a week earlier amounted to 18.4 per cent.

Crude oil production during the week ended Sept. 11 averaged 4,353,950 barrels daily, a record amount, 118,500 barrels above the figure for the preceding week but 198,150 barrels under the average recommended by the Petroleum Administration for War.

Bituminous coal production in the same period averaged 1,920,000 tons a day, as against 2,009,000 tons a week earlier and 1,838,000 tons a year ago.

Engineering construction contracts awarded during the week ended Sept. 16 totaled \$43,332,000, according to *Engineering News-Record*, as compared with \$36,606,000 in the preceding week and \$206,028,000 in the corresponding period last year. Total contracts for the year to date are 68 per cent below the comparable 1942 figure.

Professor Fisher's index of wholesale commodity prices for the week ended Sept. 17 stands at 111.0 per cent of the 1926 average, as compared with 110.8 a week earlier and 107.5 a year ago.

Member bank reserves increased \$378,000,000 during the week ended Sept. 15, and excess reserves rose \$610,000,000 to an estimated total of \$2,050,000,000. Business loans of reporting member banks increased \$30,000,000 during the preceding week and stood \$793,000,000 below the total a year earlier.

Frazer Resigns as President of Willys

Joseph W. Frazer has resigned as president and general manager of Willys-Overland Motors, Inc., effective September 30. Mr. Frazer's resignation comes at the termination of a contract that had covered approximately five years. He had been president at Willys since January, 1939. Prior to that, he was with Chrysler Corp. as vice president and sales manager of the Chrysler Division.

AUTOMOTIVE and AVIATION INDUSTRIES

SHE'S A
WOW★



PHOTO COURTESY THE HOSDREG CO., INC., HUNTINGTON, INDIANA

SHE'S GINNY CLOSE—21 years old—95 pounds—married—member of the 10% Club—she's a WOW*. In fact she's the smallest multiple spindle automatic lathe operator in the world.

But she holds a more important record—2286 shells produced in 8 hours with the help of her 8-spindle Conomatic. She does her own tool setting, loads the machine with stock, beats the boys at their own game, then

takes care of her six room house, and feeds 100 chickens and a farmer husband.

The Hosdreg Company is pretty proud of Ginny, with her cheerful attitude and happy smile—and also proud of their Conomatics, with their easy operating features and outstanding production capabilities. Get a WOW like Ginny and a Conomatic on the job, and you're bound to break more than one record!

*Woman Ordnance Worker

COME Automatic Machine Company, Inc., Windsor, Vermont

October 1, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

51



Awards

Names and winners of Army-Navy "E" awards in or allied with the automotive and aviation industries, announced since the Sept. 15 issue of *Automotive and Aviation Industries* went to press.

BENDIX - WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY, Elyria, Ohio.
CHAMPION SPARK PLUG COMPANY, Toledo, Ohio.
CUSHMAN MOTOR WORKS, Lincoln, Neb.
GENERAL MOTORS CORPORATION, Fisher Body Detroit Div., Detroit, Mich.
GENERAL MOTORS CORPORATION, Ternstedt Mfg. Div. 9, Detroit, Mich.
GENERAL MOTORS CORPORATION, Oldsmobile Div., Kansas City Plant, Kansas City, Mo.
HOOF PRODUCTS COMPANY, Chicago, Ill.
HYDRAMATIC MACHINE CORPORATION, New York, N. Y.
INDEPENDENT ENGINEERING COMPANY, O'Fallon, Ill.
UNITED AIRCRAFT PRODUCTS, Inc., Vernon, Cal.

"E" Star Awards

for continued meritorious services on the production front have been awarded to the following firms:

ARO EQUIPMENT CORPORATION, Bryan, Ohio, plant.
BUFFALO PUMPS, INCORPORATED, Buffalo, N. Y.
CONTINENTAL RUBBER WORKS, Erie, Pa.
B. F. GOODRICH COMPANY, Louisville, Ky., and New York plants.
A. SCHRADER'S SON, Brooklyn, N. Y.
SILENT HOIST WINCH & CRANE CO., Brooklyn, N. Y.
SUMMERILL TUBING COMPANY, Bridgeport, Pa.
SWITLIK PARACHUTE COMPANY, New York, N. Y.

An additional gold star for continued meritorious services has been added to the "M" pennant of Jenkins Bros., Bridgeport, Conn.

Obituary

Franklin H. Dewey, 62, vice-president of Gar Wood Industries, Inc., died Sept. 9 at his home in Detroit. He joined the Packard Motor Car Co. as a truck engineer in 1916. Later he became affiliated with the Horizontal Hoist & Body Co., which was purchased by Gar Wood Industries in 1923.

Richard C. du Pont, 31, special assistant to Gen. H. H. Arnold, chief of the Army Air Forces, on the glider program, was killed with three others Sept. 11 in the crash of a glider in a test flight at March Field, Cal. Du Pont was president of All-American Aviation, Inc., until he became a consultant to Gen. Arnold. He was national soaring champion for five straight years and set an international distance record of 153 miles from Elmira, N. Y., to Somerset, N. J., in 1934.

Francis L. Beaupre, 73, a body engineer for 29 years with General Motors

Corp., died Sept. 6 at his home in Detroit. He began his business career with the Babcock Carriage Co., Watertown, N. Y., in 1886. In 1900 he joined the Studebaker Corp. and in 1912 he became affiliated with General Motors. He retired two years ago because of illness.

Kenneth E. Nighman, 38, public relations manager at the Detroit plant of U. S. Rubber Co., died Sept. 4 at his home in Detroit after a short illness. He was a sales engineer with Fisk Tire & Rubber Co. before joining U. S. Rubber Co. in 1941.

Charles A. Verschoor, 55, president of the Precision Parts Co., Ann Arbor, Mich., died suddenly Sept. 3 at his home in Ann Arbor.

Pump Engineering Changes Name

Effective Oct. 1, the name of Pump Engineering Service Corporation, Cleveland, Ohio, was changed to PESCO Products Co. This change has no effect on present personnel or on the company's affiliation with Borg-Warner, the parent company.

Sheldrick Resigns

Lawrence S. Sheldrick has resigned as chief engineer and motor designer of Ford Motor Company. He has been with Ford since July 10, 1922, when Ford purchased the Lincoln Motor Company. He will be succeeded by Dale Roeder, formerly assistant in charge of Truck engineering and J. J. Wharam, in charge of Lincoln chassis engineering. E. T. Georgie, director of design for Ford for the last eight years, also has resigned.

Industrial Marketers Elect New Officers

Lawrence W. Martz, director of technical services for Micromatic Hone Corp., has been elected president of the Industrial Marketers of Detroit for 1943-44. He succeeds Bruce Morse, advertising manager of Square D Co. Other officers are T. D. Emerson, Carboly Co., vice-president; Charles M. Shower, C. M. Gray & Associates, secretary, and L. Hyatt Eby, treasurer. Directors are John H. Varnum, Square D Co.; Grant L. Hamilton, Brooke, Smith, French & Dorrance, Inc., and E. E. Elder, Detroit representative of AUTOMOTIVE AND AVIATION INDUSTRIES.

Detroit Rex Products Company Changes Name

Robert A. Emmett, president and chairman of the board of Detroit Rex Products Company, metal cleaning engineers, states that Detrex Corporation replaces Rex Products Company as the new firm name. No change in ownership, company policy or management will be made.

PUBLICATIONS

Houghton on Quenching, is the title of a new booklet on the quenching of steel, prepared by the Houghton Metal Research Staff, E. F. Houghton & Co. It outlines the principles of the heat-treating of steel and deals with both the familiar and advanced techniques in the quenching media involved in the processes.*

Felt Facts, a new booklet issued by The Felt Association, Inc., tells the story of the manufacture, and of some of the myriad uses of wool felt. Among subjects discussed are its many applications in engineering and mechanical fields as an alternate for rubber, cork, certain fabrics and plastics, and other priority materials.*

A new catalog on **electric furnaces** for precision heat-treating has been issued by General Electric Company. It is number 4049.*

Rohm and Haas Co. has compiled a new technical booklet on the mechanical properties of **Plexiglas**. It includes details of the test methods as well as the results so that engineers and designers may properly evaluate the given data.*

Bulletin No. 1145 has been issued by Buda Company, describing the new **F2 Model Roadmaster**, a two to four man inspection car.*

Oakite Products, Inc. has issued a new 16-page booklet describing **Oakite Composition No. 90**, a new, scientifically developed material for anodic degreasing of steel and copper.*

A wall chart containing all essential information on **Cherry Blind Riveting** operations has just been published for aircraft plants, schools, field service depots, engineering departments, etc., by Cherry Rivet Company.*

A new bulletin E-843 describing **Universal Slotmasters**, including illustrations and detailed information, has been released by the Special Machinery Div. of Experimental Tool & Die Co.

Section I of The B. F. Goodrich U. S. Army Training School Manual, dealing with **Care and Maintenance of Combat Tires**, has been made available by the company. It gives information on the proper care, preventative maintenance and servicing of tires, tubes, endless and block tracks and other rubber products.*

* Obtainable by subscribers within the United States through Editorial Dept. AUTOMOTIVE and AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

CALENDAR

Conventions and Meetings

SAE Nat'l Aircraft Engineering & Production Mtg., Los Angeles, Sept. 30-Oct. 2
 National Safety Congress, Chicago, Oct. 5-7
 American Society of Tool Engineers, Indianapolis, Oct. 10-12
 American Welding Society, Chicago, Oct. 18-23
 National Metal Congress, Chicago, Oct. 18-23
 SAE Fuels & Lubricants Mtg., Tulsa, Nov. 4-5
 Natl. Standard Parts Assoc. Management Planning Conference, Chicago, Nov. 9-10
 SAE Annual Mtg. & Eng. Display, Detroit, Jan. 10-14

How to reduce PRODUCTION INTERRUPTIONS caused by tools



Many busy war plants have found the answer to the problem of getting more production per machine by using the Carpenter Matched Set Method of tool steel selection. Because it provides a definite *system* for selecting the one steel that is best for each tool, this method helps to get tools that give longer *uninterrupted* production. Thousands of successful applications have proved that the Matched Set Method definitely helps to get more productive time from machines and tools.

Below are two actual production line examples of how the Carpenter Matched Set Method has helped others get increased output from present equipment.

If you are anxious to get better tool performance in your plant, the Carpenter Matched Set Method can help you. The two books below can help put it to work in your plant.

WANTED:— HIGHER PRODUCTION

JOB: Punching $\frac{3}{16}$ " thick O.H. steel sheets—19 punches and dies (Fig. 1) to the set-up. As this was a very tough job, the steel first tried was Carpenter's R.D.S. (Oil-Tough), toughest of the Oil-Hardening Matched Set. This gave 190,000 holes between grinds.

PROBLEM: To step up production per grind—so as to cut down shut-down time required for regrounding.

SOLUTION: Reference to the Matched Set Method indicated that greater wearing qualities could be obtained by moving north from R.D.S. to STENTOR (Oil-Hard).

RESULT: Punches and dies made from Stentor stepped up production over 100%—to 387,000 holes per grind. And here is an important point—while Stentor was chosen for its greater hardness, it also proved to have sufficient toughness to handle the job.

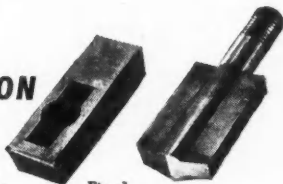


Fig. 1

TWO JUMPS TO FIND THE ANSWER

JOB: Making 3" diameter rolls used for rolling a bead on stainless strip .008" thick. Note the thin edge on the bead.

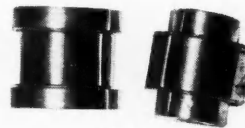


Fig. 2

PROBLEM: When made of carbon tool steel, the thin bead cracked in hardening, so the Matched Set Method was followed to STENTOR (Oil-Hard) for "greater hardening safety." When made of Stentor, the bead stayed on in hardening safe enough, but when placed in service the strain was too much for the thin section in this hard steel, and the edges chipped.

SOLUTION: Referring again to the Matched Set Method indicated that moving south to R.D.S. (Oil-Tough) would provide greater toughness.

RESULT: Made of R.D.S., the rolls shown in Fig. 2 had turned out "miles" of molding when this picture was taken—and the bead is still there!



For "Refreshing" Skilled Tool Makers and Training New Men. More than 35,500 copies of this text book are now in use. Copies are available to tool steel users in the U.S.A. at cost, \$1.00—\$3.50 elsewhere.



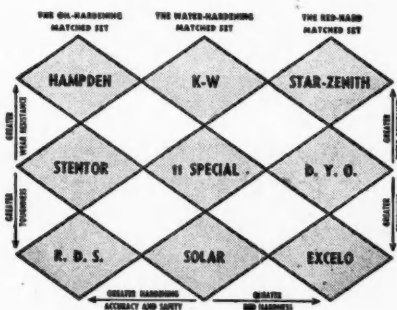
For Tool Room Foremen and Tool Hardening. A 167-page manual with a comprehensive explanation of the Matched Set Method of Tool Steel Selection, detailed heat treating data, hardening instructions. Free to tool steel users in the U. S. A.



The Carpenter Steel Company 103 BERN ST., READING, PA.

Carpenter MATCHED TOOL STEELS

IMPORTANT
BEFORE...
VITAL NOW



New Products for Aircraft

(Continued from page 39)

rated output at speeds as low as 4400 rpm. Adequate cooling for both main engine and auxiliary power plant operation has been provided by means of integral cooling fan and air spout for blast cooling, which permits circulation of air through the hollow armature shaft.

A floating type of flexible torque drive shaft is internally splined to the tubular armature shaft at the commutator end of the generator and held in place by a lock ring. An integral drive

spline is provided on the drive end of the flexible torque drive shaft which extends through the back head and engages the engine driving member, thereby absorbing engine torsional vibration and compensating for any slight drive misalignment. The armature shaft is mounted on prelubricated sealed ball bearings which prevent entrance of any dirt or foreign matter into the bearings and assure proper lubrication under conditions of blast cooling.



CAST ALUMINUM FITTINGS

YES! NIBCO fittings of cast aluminum . . . accurately machined to absolute uniformity . . . are moving at ever increasing speed into the aircraft plants where they're needed . . . delivered on time . . . meeting the most rigid standards and the stiffest inspection. The same engineering genius which developed the NIBCO Wrot Fitting formed in one step from a straight tube of copper, is meeting in outstanding fashion, the new problems which the war has created. Our facilities are 100% devoted to War work now . . . but when the new day comes . . . you'll need us and we'll need you.



NORTHERN INDIANA BRASS CO.

ELKHART, INDIANA

VALVES AND FITTINGS SINCE 1904



Improved commutation and generator efficiency has been obtained by incorporating both interpole and compensating coils which develop auxiliary magnetic fields proportional to the load current and opposed to the magnetic field developed in the armature core by the flow of load current through the armature coils. The interpole and compensating coils prevent armature reaction and reactance voltage from causing destructive sparking at the generator brushes under all load conditions, eliminating the need for brush adjustment to prevent sparking at the commutator.

Improved brush material has been used to increase the brush life under high altitude operating conditions. Weighing only 36 lbs the generator frame measures 12 5/32 in. from the alloy steel mounting flange to the back end and is 6 in. in diameter.

Portable Spark Plug Testing Unit

A recent development of Airplane Manufacturing & Supply Corporation, North Hollywood, Cal., is a portable spark plug testing unit. This unit is designed to test and overhaul BG, Aero, Bendix and AC aircraft spark plugs. The cabinet, including all necessary



Portable spark plug testing unit

tools, weighs 84 lbs, and is 26 in. wide, 12 in. deep, and 19 in. high.

The tester, normally operated by a 1/8 hp electric motor, has a hand crank for use when 110 volt current is unavailable, and a hand pressure test bomb to supplement CO₂ supply. The unit also includes a point setter electrode adjuster. The newly designed top includes two built-in racks capable of holding 38 spark plugs.

Eclipse Type 1042 Voltage Regulator

The Eclipse-Pioneer Division of Bendix Aviation Corporation, Teterboro, N. J., has developed a series of carbon pile voltage regulators which will handle all types of aircraft generating systems in present or contemplated use. Eclipse Type 1042 Carbon Pile Voltage Regulator is designed to control the voltage of 24 volt aircraft systems which use engine driven generators in



THE award of the coveted ARMY-NAVY "E" for outstanding production is recognition of our efforts in the design and manufacture of oil filtration equipment for internal combustion engines.

We are fully conscious of the responsibility which the "E" places upon us to reach new goals in production, and to continue intensive research in this vital field of engine and oil maintenance for the war effort.

BRIGGS CLARIFIER COMPANY



WASHINGTON, D. C.

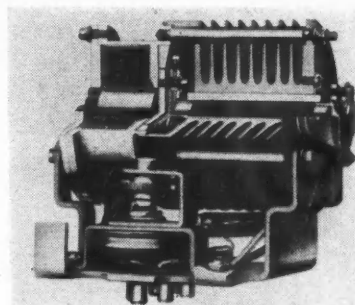
Designers and manufacturers of filtration equipment.

either single or parallel, main engine or auxiliary engine operation, and rated from 1.5 to 6 kw.

The regulator consists of a stack of carbon discs held in a supporting housing which incorporates fins to facilitate the dissipation of heat. Carbon contact plugs, at either end of the stack, provide electrical contact to the carbon pile. Regulation is accomplished by increasing or decreasing the pressure on the stack of carbon discs by a series of radially arranged leaf springs which are controlled by an electro-magnet. This action varies the resistance of the carbon stack which is in the generator field circuit. Since the electro-magnet

is actuated by the generated voltage, a constant generated voltage is maintained without lag or fluctuation. The magnet has a main shunt winding and an additional load compensating winding for use when the generator is operated in parallel with other generators. The regulator is so constructed that it is impervious to air-borne foreign matter which might be present under conditions of blast cooling.

The Type 1042 Carbon Pile Voltage Regulator can be used in conjunction with any 30 volt generator that requires a resistance range of .7 to 55 ohms and wherein the maximum regulator wattage will not exceed 75 watts



Sectional view of Eclipse Type 1042 Carbon Pile Voltage Regulator

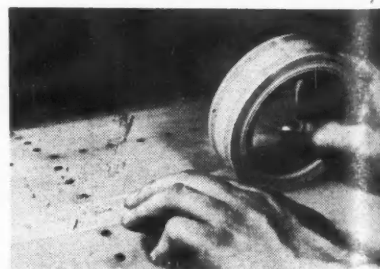
continuously. For installation where the voltage regulator can be blast cooled, the unit may be operated continuously at 100 watts.

Since the carbon discs incorporated in the voltage regulator are under continuous pressure, voltage regulation is not affected by normal conditions of vibration and the regulator may be mounted in any position although it is preferred that the axis of the regulator be kept horizontal. Voltage regulation will not be subject to more than .2 volts variation regardless of the position.

As the carbon discs are always in contact with each other and the change in resistance is obtained by increasing or decreasing pressure on the carbon pile, a continuous and constant generated voltage is maintained without lag or fluctuation despite varying engine rpm and load requirements. The overall dimensions are 4 9/16 in. long, 4 1/16 in. wide, 3 3/8 in. high, and the weight is 2.6 lbs.

Transparent Rivet Tape

A rivet tape made of transparent glassine paper is a new product brought out by Adhere, Inc., Los Angeles, Cal. Both edges of the paper are coated with gum having sufficient adhesion to hold

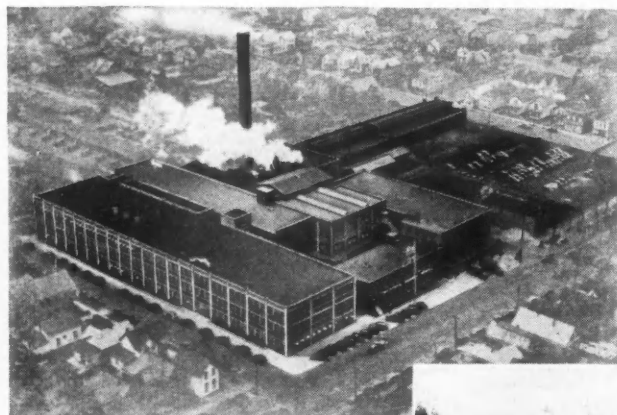
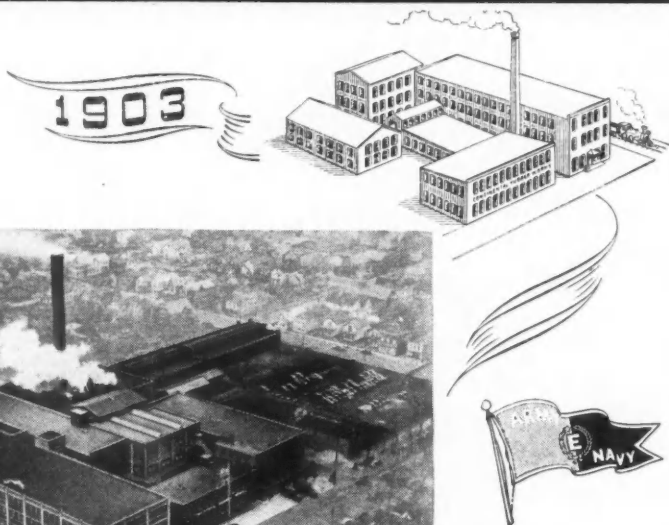


Adhere Rivet Tape

the rivets in place until they are riveted. When the riveting is finished, the Adhere Rivet tape peels off quickly and cleanly, leaving no adhesive to be wiped off.

**Back the Attack
with War Bonds**

CONTINENTAL RUBBER WORKS



1943



40 Years OF CONSTANT PROGRESS

Organized in 1903—operating under the same management in 1943. Pioneers in rubber for motor cars—and aircraft. Originators of vital molded and extruded industrial rubber products. Pre-war users of synthetics. Suppliers of essential equipment for Army, Navy and Airforce. Geared to produce new types of mechanical rubber for post-war business.

CONTINENTAL RUBBER WORKS, ERIE, PENNSYLVANIA, U.S.A.

MAKERS OF THE **VITALIC LINE** FOR 40 YEARS

"Sons-a-Guns"

AUTOMOTIVE
SPARK PLUG -
built by AC since
1908

NINETY pounds of fire-power,—that's the .50 caliber Browning machine gun that AC builds by the thousands, night and day

Manufacturing these guns demands the highest order of precision workmanship. Nearly every one of the 3,500 production operations on each gun requires split-hair accuracy.

Yet, the Army knows that good manufacturing is not enough to keep those guns in trim. They must also be regularly serviced. So, they are cleaned, oiled, and adjusted in strict accordance with rigid Army requirements.

A Special Message for You

AC has been producing another kind of fire-power since 1908. It's the precision-built AC Spark Plug. The chances are good that you drive with AC's. But, whether you do or not, your spark plugs need to be cleaned and adjusted,—to make them last longer, save gasoline, and improve starting ease.

Your automotive service man can do this for you. He can also give Conservation Service, outlined in the panel below, on the eight other AC products in wide use on millions of vehicles.

To help bring Victory quicker, make regular use of this Conservation Service. And when replacement is necessary, select AC—for complete satisfaction.

Awarded to the men and women of AC on September 2, 1942, for outstanding achievement in producing for Victory.

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

SPARK PLUGS—Dirty or worn plugs waste as much gas as one coupon in ten. Oxide coating collects on the plugs and causes them to misfire,—especially when the engine is working hard. Dirty plugs also cause hard starting which weakens your battery. Under present slow driving conditions, have your plugs cleaned and adjusted every few months.

AIR CLEANERS—A dirty air cleaner increases gasoline consumption because it chokes down the flow of air into the carburetor. Your air cleaner should be rinsed whenever your car is lubricated.

FUEL PUMPS—Practically trouble free. But, if yours has been in use thirty or forty thousand miles, it may be worn to the point where a check-up is due.



DRIVING INSTRUMENTS—Speedometer, gasoline gauge, oil pressure gauge, ammeter, and temperature gauge seldom need service. But, if they give trouble, have them cared for at once.



OIL FILTERS—Slow driving accelerates formation of soot and carbon in engine oil. If not constantly filtered from the oil, this dirt will clog piston rings, cause increased consumption of oil and gas. So, replace your oil filter element whenever your dealer's AC Oil Test Pad shows that your oil is dirty.

BACK THE ATTACK—WITH WAR BONDS!

Reproduction of current advertising
appearing in national and farm
publications.

AC is carrying Conservation Service into the field to be helpful to all those who use and service AC products; and bringing before them the high quality and precision manufacturing—for civilian and war products, alike—for which AC has been known for more than thirty-four years.

Russian Lagg-3 Fighter

(Continued from page 32)

and starboard is effected by movement of the rudder bar. Brakes are applied with the right hand and are adjustable by the pilot from his seat.

Five fuel tanks are provided, three in the center section and one in each outer section of the wings. They are made of hard aluminum sheet, with gas-welded seams and spot-welded swash plates. For protection against gunfire all tanks are completely encased in rubber sheathing, 13/32 in.

thick at the bottom and 3/16 in. on the top and sides. Instead of the usual sponge rubber, the sheathing consists of solid rubber with four layers of cord fabric, thus resembling a pneumatic tire in construction.

On two examples of Lagg-3 examined a hand pump was fitted to supplement the engine-driven fuel pump, but on a third example this auxiliary pump was omitted.

The method of leading inert exhaust

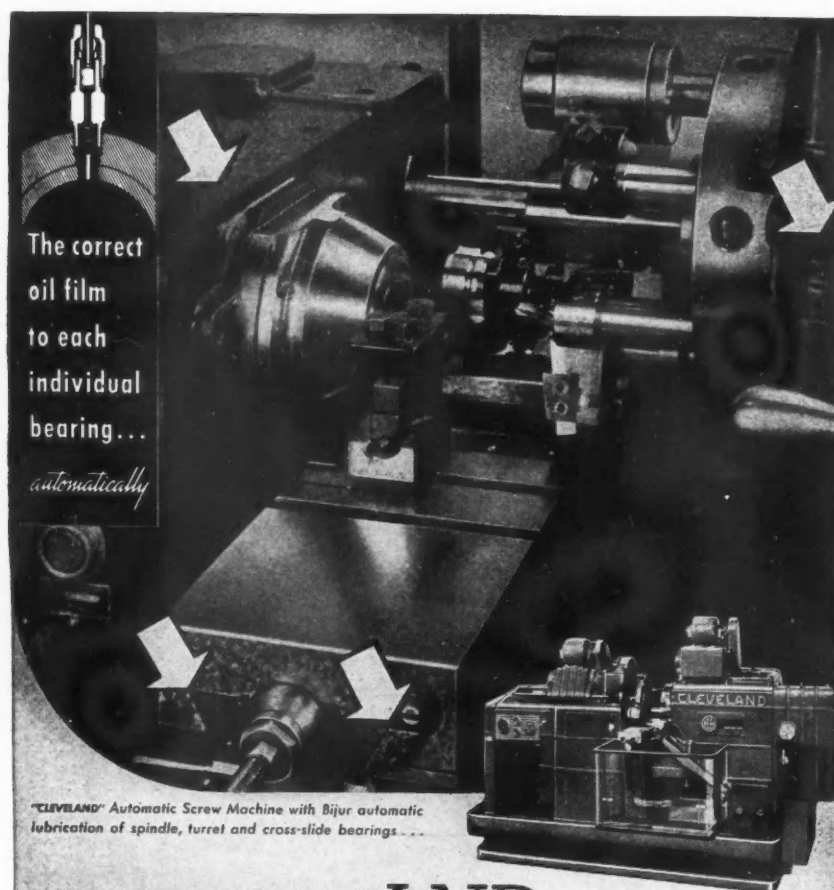
gases into the fuel tanks is as follows: A steel pipe of 2 in. diameter leads from the rearmost exhaust stub on the port side to a small steel tube (19/32 in. bore) approximately 40 in. in length. This tube leads in turn into an aluminum pipe carrying the gases along the fuselage to two chambers just forward of the tail. One of these chambers is filled with copper shavings and acts apparently as a filter, while the other is empty and acts as a trap for condensed water. From these chambers another aluminum pipe runs forward along the starboard side of the fuselage to a combined pressure gage and valve. When the latter is in one position it directs the gases into a distributing chamber from which they are led by small bore pipes to the fuel tanks. In the other position of the valve the gases escape directly to atmosphere. The gases are also taken to a small tank for inverted flying located inside one of the others. In some installations the change-over cock is omitted and the continuous gas flow to all tanks is controlled by relief valves.

Two lubricant tanks are located behind the fireproof bulkhead. The oil cooler is under the engine and the engine coolant radiator under the fuselage slightly behind the pilot. Coolant temperature is controlled by throttling the air intake either by louvers electrically operated or, in earlier versions, by manual control.

Reverting to the power plant, three pressure carburetors are used for each block of six cylinders. There are three valves per cylinder, two inlet and one exhaust, and an unusual feature is that while the inlets are operated by rockers, the exhausts are operated directly by the overhead camshafts. A two-stage two-speed supercharger is used, mechanically controlled from the cockpit and with gear ratios of 7.8 and 10 to 1. Crankcase ventilation is provided by air taken in through a forward-facing pipe on the right side and an outlet pipe directed rearwards on the left side.

The propeller is a three-bladed all-metal Wisch-61P with hydraulic pitch control over about 35 deg and constant speed governor. Its diameter is 9.8 ft, blade width 10.2 in. and weight 291 lb. The two machine guns, synchronized with and firing through the propeller are of 0.5 in. caliber and are mounted above the engine. The 20 mm cannon located between the cylinder blocks has its long barrel projecting through the propeller shaft bore and slightly beyond the spinner. It is gas-operated and belt-fed with compressed air cylinder adjacent, and is fired by use of a lever between the instrument panel and a reflex sight.

The six rocket fragmentation bombs are carried on rails, three under each wing, and have an explosive charge in the nose and a propelling charge behind. The tail has a discharge nozzle and four stabilizer fins. The propelling charge is described in the Swedish report as consisting of "hollow sticks of



"CLEVELAND" Automatic Screw Machine with Bijur automatic lubrication of spindle, turret and cross-slide bearings...

For speed AND ruggedness

• Whatever the bearing surface, its location or lubrication need, BIJUR maintains the correct, metered oil film—automatically. Any number or combination of bearings—any type of machine! For high production maintained over long periods... Bijur built-in lubrication.

BIJUR LUBRICATING CORPORATION • LONG ISLAND CITY, N. Y.

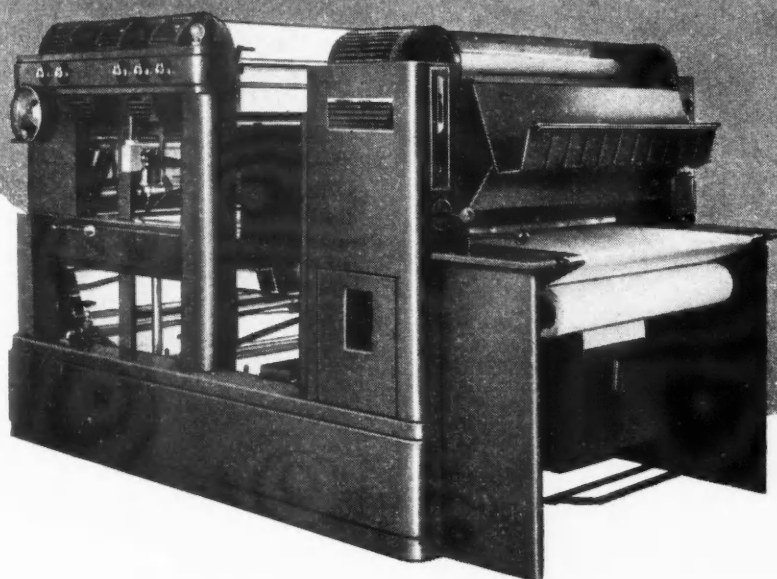
BIJUR

AUTOMATICALLY *Correct* LUBRICATION

OUTSTANDING

Performance

proved daily by PEASE BLUEPRINTING MACHINES
in Engineering Departments from coast to coast



Pease "22-16" — Continuous Blueprinting, Washing, Developing and Drying Machine—Production Speed, 20 feet per minute. (Pease "22," not shown, has a Production Speed of 30 feet per minute.)

While American industries astonish the world with unbelievable production, Pease Continuous Blueprinting Machines, with a production speed of 30 feet per minute,* are more than meeting every requirement by producing millions upon millions of square feet of all important Blueprints. From the Atlantic to the Pacific, from Canada to the Gulf, Engineering Departments are depending upon Pease Machines to supply them with a limitless flow of better Blueprints, faster and at lower per square foot cost.

Performance must be proven by records of outstanding achievement. Pease Continuous Blueprinting, Washing, Developing and Drying Machines have just such records... records showing the greatest production of Blueprints ever accomplished... records showing the greatest speed and highest quality of Blueprint production at the lowest cost... records showing long life, reliability, service and efficiency... records showing more Pease Blueprinting Machines in use than any other make.

Write for descriptive literature... no obligation, of course.

THE C. F. PEASE COMPANY
2635 WEST IRVING PARK ROAD • CHICAGO 18

EXCLUSIVE PEASE FEATURES

- ★ **Sliding "Vacuum-like" Contact** smooths out tracings, prevents errors in printing.
- ★ **Three Speed Lamp Control** provides operation at 10, 15 or 20 amperes, minimizes running speed and dryer heat changes.
- ★ **Actinic "No-Break" Arc Lamps** burn for 45 minutes without breaking arc, resume instantaneously.
- ★ **Horizontal "Floating" Water Wash** floats prints free from tension and prevents wrinkles, stains, bleeding.
- ★ **Quick Change Chemical Applicator System** very economically allows change from Blueprints to Negatives in 20 seconds.
- ★ **Eight-Inch Drying Drums**, thermostatically controlled, heated by gas or electricity, dry the prints "flat as hung wallpaper."

* Pease "22"

Pease Blueprinting Machines

A TYPE AND SIZE FOR EVERY REQUIREMENT INCLUDING
DIRECT PROCESS PRINTING AND DEVELOPING MACHINES

some apparently slow-burning explosive, electrically fired from the cockpit." The velocity due to the propelling charge is said to be of the order of 820 fps and to increase materially the penetration of the projectile up to approximately 7 in. of armor plate. The report refers to a case in which this "weapon" was used in aerial combat and hits registered up to a range of about 2000 ft.

German pilots are said to consider the Lagg-3 superior in combat qualities to the Mig-3, an earlier and successful type of Russian fighter, but Finnish pilots are stated to be critical of its capabilities, saying that while it is

satisfactory in horizontal flight, its acceleration is poor and that it has a tendency to go into a spin on sharp turns. Visibility is said to be good forward but insufficient to the rear. The

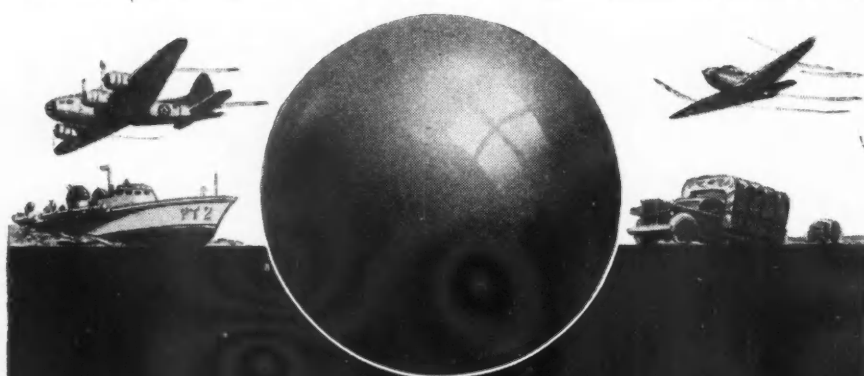
vulnerability of the coolant radiator and wing fuel tanks is also criticized by the Finns, as is the armor protection, which (13/32 in. thick) occurs only at the back of the pilot's seat.

New Products

(Continued from page 44)

and impermeability to gases and liquids. It is said that, because of the inclusion of a sealed-in, non-extractable plasticiser in the compound, air, water, sunlight, acid and alkaline solutions, and temperatures up to 250 deg F do

not have any effect on it. Marvinol is said to retain its elasticity, resiliency and flexibility just as rubber does, with the added advantage that it does not have rubber's tendency to age or oxidize.



STROM STEEL BALLS

Now at War - Later in Peace

Strom Metal Balls are now being used in the vehicles of war. But in the peace to come, they will again be dedicated to the designing and building of better methods for air and automotive transportation.



Largest independent and exclusive metal ball manufacturer

Strom

STEEL BALL CO.

1850 South 54th Avenue • Cicero, Illinois

Safety Seal for Fire Extinguisher

A new device to provide protection against fire sabotage is now available from The General Detroit Corporation, Detroit, Mich. Known as the General Safety Seal, it is designed to prevent fire extinguisher tampering or clogging and is offered in models to fit all standard types of extinguishers.

Constructed of heavy water-repellent



General Safety Seals for fire extinguishers

stock, the General Safety Seal has three standard types of design. Foam and soda acid extinguishers are protected by a stitched envelope which slips snugly over the hose and fastens around the control valve. Vaporizing liquid extinguishers are fitted with two caps, one covering the pump end and the other protecting the nozzle. Carbon dioxide extinguishers are guarded by a cup-type envelope which fastens tightly over the nozzle horn. All protective envelopes or caps are securely held in place by a tamper-proof wired seal. The envelope cannot be removed or the extinguisher used without breaking the seal. Thus the extinguisher cannot be tampered with or become clogged without warning, and the danger of explosion is reduced.

**TODAY
TANK PARTS**

**TOMORROW
?**



PLAN YOUR DISTRIBUTION SYSTEM

FOR *Quick Conversion*

Future demands on your plant depend on events no man can accurately foretell. Sound practice today calls for farsighted planning—to insure the ability to make quick production shifts economically.

Such shifts depend to a large extent on your plant distribution system. For on it hinges the ability to meet quickly changes in the nature, location and density of loads.

That's why we say *plan now for maximum flexibility in your plant distribution system*—to give increased efficiency and sabotage protection today, to facilitate speedy and economical conversion tomorrow.

Westinghouse has designed and built hundreds of distribution systems for all types of plants.

Thus our engineers are in a position to recommend the “one best” distribution system for your plant—the system that provides maximum flexibility with the least use of critical materials.

To bring this broad engineering experience to bear on your particular problem, call our local office. Or send for the helpful booklet below. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pennsylvania.

J-94562

UP-TO-DATE FACTS ABOUT DISTRIBUTION SYSTEMS

Keep up-to-date on latest plant distribution systems. Send for 24-page Booklet, B-3152, which briefly describes different plant distribution systems, and points out the advantages of each.



Westinghouse
PLANTS IN 26 CITIES . . . OFFICES EVERYWHERE



PLANT DISTRIBUTION SYSTEMS

October 1, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

63

Use of Glow Plugs in Cold Starting Diesel Engines

(Continued from page 29)

so as to be suitable for this type of work. A typical two-pole glow plug design is shown in Fig. 4. The center spindle A (interior pole) is insulated from sleeve B (exterior pole) and the outer shell C by mica insulation 1 and 2. When installing a glow plug, care must be taken that sleeve B does not come in contact with the cylinder wall E as this would ground the circuit.

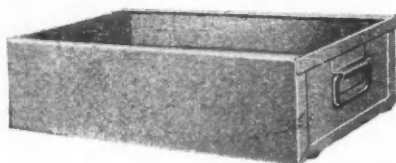
If, in the installation or re-installation of glow plugs one or more are accidentally dropped, these plugs should not be installed as the heating coil D might have been bent out of concentric position. A small gage fitted over the heating coil and end of sleeve, containing a bore of the same diameter as the outside of the sleeve, will quickly indicate if this is the case. If it is found that

the heating coil does not touch any part of the hole in the gage, the plug is OK to be used, but if the heating coil touches the coil at any point, same must be straightened to the established clearance around heating coil D. In the installation of new glow plugs it is important that seat 3 is absolutely clean and smooth in order to obtain a gas-tight joint when the plug is tightened.

To properly service glow plugs it is advisable to clean them periodically depending on the length of service in the engine. When plugs are removed from the engine block the pocket in the cylinder surrounding the heating coil should be thoroughly cleaned of all carbon deposits before glow plugs are re-installed. The glow plugs should be cleaned by using fine sandpaper, revolving the plug if possible, in a lathe and removing all carbon deposits. The bottom of the plug where the heating coil is fastened should be scraped clean with the use of a scraper or knife, taking care not to damage the exposed mica installation between spindle A and sleeve B and between sleeve B and outer shell C at point 2. After the plug is cleaned it should be tested for short-circuit between shell C and sleeve B and then tested for contact between sleeve B and spindle A. The servicing of glow plugs in a Diesel engine requires a little more care than regular spark plugs used in a gasoline engine and it is important that the mechanic in charge follow the simple instructions necessary to insure perfect performance and long life.

The higher sulphur content in the combustion gases of a Diesel engine requires the use of a special wire in the glow coil to resist oxidation at high temperatures and freedom from attack by the sulphurous atmospheres. A resistance wire life test chart of glow plug installations in a six cylinder engine is shown in Fig. 5. Line 1 shows a life of 500 hr obtained at 3000 F and a current draw of 75 amps; Line 2 a life 1650 hr at 2400 F and 60 amps; and Line 3 a life of 3000 hr at 1525 F and 38 amps. Two important factors must be kept in mind when designing a glow plug. The temperature of the glow coil must be high enough to assure quick starting of the engine in low temperatures, but not too high so as to give long coil life and to avoid excessive current draw on the starting battery. There are several types of glow plugs necessary to meet the varying demands of the numerous Diesel engines but standardization of types should be seriously considered in the design and development of new engines in order to facilitate servicing and to avoid misapplications, which are really the only cause of trouble.

IMMEDIATE SHIPMENT STEEL BOXES FOR YOUR PRODUCTION NEEDS



STYLE 300 STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handle each end. Runners save wear on bottom of box and act as positive stacking lock.

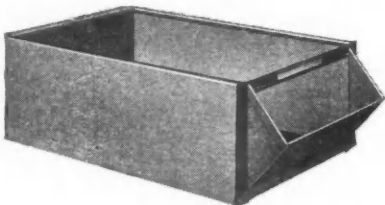
No. 301	6" x 9"	x 3 1/2"	—20 ga.	\$.55 Ea.
No. 302	8" x 12"	x 4"	—20 ga.	\$.60 Ea.
No. 303	9" x 13 1/2"	x 4 1/2"	—19 ga.	\$.75 Ea.



STYLE 600 STACKING BOX

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as positive stacking lock and reinforce box at point of maximum wear.

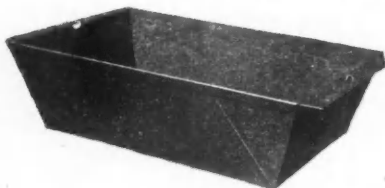
No. 601	10" x 16" x 6"	—18 ga.	\$.95 Ea.
No. 602	12" x 18" x 8"	—16 ga.	\$ 1.25 Ea.



STYLE 500 STACKING BOX

Open front makes contents easily accessible when boxes are stacked. Will stack with Style 600 Boxes.

No. 501	10" x 16" x 6"	—18 ga.	\$ 1.15 Ea.
No. 502	12" x 18" x 8"	—16 ga.	\$ 1.50 Ea.



STYLE 100 TAPER PAN

One piece, all-welded construction. Hook handle at each end. Will nest perfectly when empty.

No. 101	10" x 18" x 6"	—18 ga.	\$.75 Ea.
No. 102	12" x 20" x 6"	—16 ga.	\$.90 Ea.

Prices F.O.B. Factory, Phila.—Any Quantity!

Order Today—Write, Wire or Phone

AMERICAN METAL WORKS, INC.

1537 Germantown Avenue, Phila. 22, Pa.

**Back the Attack
with
War Bonds**

Heat Treating in Aviation

(Continued from page 35)

In connection with the projected use of full-hard, cold-worked stainless steel, which ordinarily would be used in the "as rolled" condition, it has been found experimentally that strength properties are increased by an elevated temperature stress relief (heating for several hours at 600 F). Because of poor formability and excessive spring back, however, this full-hard stainless steel, with its increased properties obtained by heat treatment, has very little application for aircraft except for unformed parts.

Consolidated Vultee at present is showing little interest in sheet magnesium in spite of the large quantity which is now being produced for aircraft use. Experiments with sheet magnesium reveal that it is extremely erratic, inasmuch as there will be a wide range of physical properties even within a single sheet, and wide spreads in properties in different sheets supposedly of the same material. The company does believe that magnesium is slightly superior in certain types of castings from a weight-saving standpoint. The Consolidated Vultee engineering department and test laboratories have reached these conclusions regarding the metal after testing parts which have been heat-treated by sub-contractors and by carrying on their own experiments with the metal. The whole problem here, as usual, lies in the fact that to approximate the same weight-strength ratio as that of aluminum alloys, because of the relatively lower physical properties of the sheet metal, much more metal must be used, thus cancelling the apparent saving in weight. However, research is in progress at Consolidated Vultee to determine a practical method of increasing the strength of the various types of magnesium alloys.

In the aluminum field, Consolidated Vultee is now using the standard alloys, Alclad 24S-T in large quantities, 24S-T unclad in small quantities, and Alclad 24S-O in large quantities for formed parts which Consolidated Vultee heat-treats. Alclad 24S-O, which is in the annealed or "soft" condition, forms more readily than the S-T types. It has been found that salt-bath heat treating, as performed at Consolidated Vultee, raises the ultimate tensile strength of alclad 24S-O from 27,000 psi, as received, to 60,000 psi as 24S-T.

Standard solution and precipitation heat treatments are used on all aluminum alloys. Standard solution heat treatment consists of heating the 24S-O to 925 F for 30 min, dissolving all alloying elements in the aluminum and making it a homogeneous material at that temperature. It is then quenched in water at approximately 70 F and aged at room temperature, to "T" temper, for four days, allowing necessary natural "aging" or precipitation to take place.

Some time ago Consolidated Vultee developed a process for increasing the tensile and compressive yield strength of 24-S aluminum alloy. In this process, the material is rolled or drawn into the desired shape while it is in the annealed or soft condition. Following this, the material is given the standard solution heat-treatment, but, prior to allowing the material to age naturally at room temperature, it is plastically deformed 3½ per cent and then allowed to age naturally at room tempera-

ture. The tensile yield of this material is increased from approximately 40,000 to 51,000 psi. At the same time the compressive yield has been increased from 39,000 to 44,000 psi.

The 24S aluminum alloy thus formed, heat-treated, and stretched, and locally designated as "24-RT," has been used in the production of planes for some time with remarkable success. Among other applications its uses is in stiffeners on Consolidated Liberators.

In summarizing, it may be seen that regardless of the materials, whether it be the strategic X-4130 or the less strategic NE steels, the conventional 18-8 or the more uncommon 16-2 stainless

Engineered Diamond Tools!



DESIGNED TO GIVE BETTER PERFORMANCE AT LESS COST ON YOUR JOB!

The accuracy, precision, dependability and long life built into diamond tools by Wheel Trueing Tool Company are the result of 33 years' experience in designing, developing and manufacturing diamond tools of fine quality. These tools are the products of an organization of diamond engineers unexcelled in skill and experience—craftsmen who know grinding wheels and the application of diamonds and diamond tools to all types of production jobs.

It is no wonder that more and more production men interested in faster and more economical production are specifying diamond tools engineered to their jobs by Wheel Trueing Tool Company.

★ DIAMOND TOOLS for

STRAIGHT, FORM,
THREAD AND
RADIUS DRESSING;
TURNING, BORING,
GAGING AND
CORE DRILLING

★

WHEEL TRUEING

3200 W. DAVISON

TOOL COMPANY INCORPORATED

DETROIT 6, MICH.

steels, the everyday 24-ST aluminum alloy or the new Consolidated Vultee development of 24-RT aluminum alloy, the heat treatment operations are vital

and should be carefully controlled by a well-informed metallurgical control group to gain maximum production applications.

Renegotiation—Machine Tool Industry

(Continued from page 18)

be applied to companies manufacturing products on which the cost was known at the time the contract was entered into. That is the case with machine tools. Price ceilings on machine tools were set by OPA long before renegotiation legislation was en-

acted by Congress. Furthermore, we doubt whether renegotiation should be applied to companies furnishing to other manufacturers standard equipment of a type having universal use in time of peace as well as in time of war, and with a useful life extending

far into the postwar period. The Price Adjustment Boards, however, have proceeded to apply renegotiation well-nigh indiscriminately throughout the entire war production picture.

The machine tool industry does not object to the principle of recovery of excessive profits. The industry disagrees with the Price Adjustment Boards on the amount of profits to be returned. A portion of these profits represents earnings that under other circumstances than war would have been made over the next ten years or more; war production having simply anticipated the country's normal requirements of new machine tools by that amount. The industry seeks to retain against those next ten or more lean years a reserve sufficient to enable it to carry on, believing that a broken machine tool industry may cost this country its supremacy in productive efficiency.

Effect of the Excess Profits Tax

In the Revenue Act, Congress has established the rate of profit for the years 1936 through 1939, as a "normal" level against which to measure the amount of earnings that shall be subject to a "normal" tax. An "excess profits tax" is then applied to all earnings above that amount, of which ten per cent is earmarked for return to the taxpayer after the war is declared ended.

The excess profits tax is fair enough in principle. It makes no allowances, however, for the fact that in some businesses variations from year to year are more extreme than in others in output or services rendered. The machine tool builder, who has to contend with an extremely spasmodic demand for his product, has to earn more in the good years to carry him over the bad ones. Since it is only in the good years that the excess profits tax becomes effective, he finds that in the very years that it would be possible for him to provide against his particular rainy day, this form of tax drains away the sums that he has learned from past experience are necessary to pay the losses of operation through the dull years that inevitably follow.

As already pointed out, the machine tool industry early undertook voluntarily an enormous expansion in order to build the machine tools required for the successful prosecution of the war. The output of machine tools in 1942 was seven times the average for the years 1936 through 1939, even though those years were somewhat better than the average for the previous fifteen. The relative expansion is therefore far greater for this industry than for most others, and the excess profits tax exacts a proportionately greater toll. As a result, machine tool builders, on the average, have been assessed taxes equal to 73 per cent of their 1942 earnings before renegotiation. In contrast, many companies, particularly those in the consumer goods industries whose earn-

(Turn to page 74, please)



WIRE
...in its best fighting form

IN thousands of varied shapes "fighting wire" is on the war fronts. In bombs and shells; in tanks and guns and planes; in equipment and war material of many types, you'll find wireforms and springs doing a thousand-and-one vital jobs.

Above, you see a few of the many Accurate-made special wire shapes which are parts of fighting implements. They're produced in huge quantities to Accurate precision standards — under rigid control from raw materials to inspected finished products.

Accurate "know-how", based on experience and specialization, can help you solve your production problems that involve springs and wireforms. Tell us what you need and when you need it—it's as simple as that.

**WHAT
SPECIAL
WIREFORMS
DO YOU
NEED?**

**Accurate
Springs**

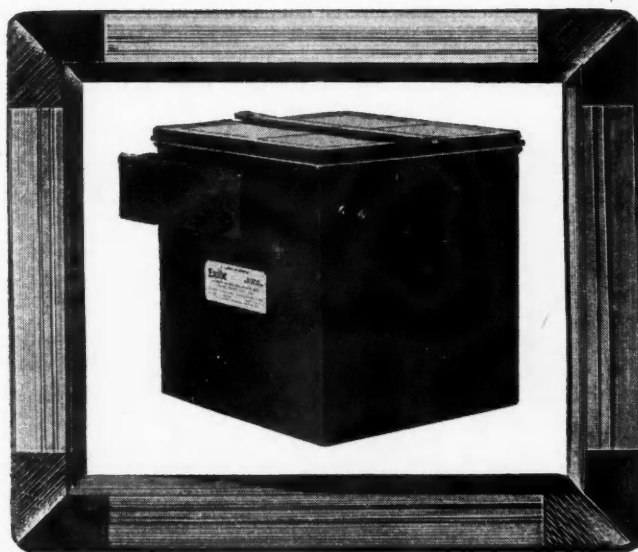
Free "Handbook on Springs". Send for your copy today. It is informative, compact, handy to use.

ACCURATE SPRING MFG. CO., 3811 W. Lake St., Chicago 24, Ill.

Portraits of Two Exide Batteries



1917



1943

BOTH HAVE A GREAT FLYING RECORD

Those first crude planes of World War I weren't much when compared to the winged monsters of today. But they went out on missions, bombed and fought . . . and most of the times . . . they came home again. In them were Exide Batteries, developed for the special needs of flight, and made with all the skill and precision at our command.

In all theatres of war Exide equipped planes are again fighting for victory, but what a difference in the battery. Since 1917, we have worked hand in hand with plane designers, manufacturers, and the Engineering Divisions of the Armed Forces. The result is a thoroughly modern battery . . . long-lasting, dependable, and easy to maintain. Many fliers may never have occasion to see their Exide, but it's there and ready . . . as the boys in the ground crew will tell you.



Exide
AIRCRAFT
BATTERIES

IN THE AIR SINCE 1917

BACK THE ATTACK WITH WAR BONDS

Real life stories of Exides in the Service



After a battle in the South Pacific, a soldier, a former Exide worker, came across a battery from a riddled plane. Naturally he was curious about batteries, so he inspected it and sure enough it was an Exide. But even more than that, he found on the battery his own "burning mark" . . . the identifying symbol that showed he himself had assembled this particular Exide.

Exide-workers now in the Armed Forces frequently write us of the performances of these batteries. They get a thrill, and we do too, at knowing how Exides are working for Victory.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia

Exide Batteries of Canada, Limited, Toronto

(Continued from page 70)

ings in 1936 through 1939 were high in relation to their earnings in the war years, are required to pay taxes as low as 55 per cent of their 1942 earnings.

To make a bad matter worse, the Price Adjustment Boards not only give no consideration to the effect of taxes, but they, too, use the tax-base years 1936 through 1939 as a measure of what a company should regard as a "normal" profit before taxes. So the unfortunate machine tool builder who had a relatively low profit in these years is twice penalized; first by the excess profits tax itself, which exacts a larger percentage of his earnings

than from most companies, and again by the Price Adjustment Board's policy of basing his allowable earnings before taxes on the 1936-39 experience, which bears no relation to his contribution to the war. The Price Adjustment Board's policy is not based on any provision of the law as Congress passed it, but the only remedy seems to be a Congressional enactment that the task of the Price Adjustment Board shall be to recover any profits which appear to be excessive after taxes.

"Profits Before Taxes"

When the Price Adjustment Board announces that a company has been

allowed to retain 15 per cent profit on readjusted sales, it means "profits before taxes." Actually there is no such thing as profit before taxes. In the minds of business men, or the people who have put their savings into the common stock of a company, a "profit" is the amount left after all costs have been paid. None of the earnings are available to the investor until the taxes have been paid.

Because of the unequal workings of the excess profits tax, the company that is allowed to retain 15 per cent "profit on readjusted sales," which may be but 11 per cent on its actual gross income for 1942, may retain only 3 per cent after taxes are paid. And it is out of that 3 per cent that the company must provide reserves against future operating losses before those who have invested their money in the enterprise may receive one dollar in dividends earned.

Renegotiation Payments in Cash

The machine tool builder may look forward to a return of 10 per cent of his excess profits taxes in the fiscal year next following the one in which peace is declared. Fighting ended in the last World War on November 11, 1918. Peace was declared when the President signed Senate Joint Resolution 16 on July 2, 1921. If history repeats itself, and if fighting were to stop in November, 1943, this postwar tax refund may be expected in 1947. This would hardly assist the machine tool builder to solve the problems he would face in 1944.

The extent to which net profits are represented by buildings, equipment and inventory brings to the fore another difficulty of renegotiation—the fact that renegotiation payments must be made in cash. A company cannot pay either taxes or renegotiation refunds in bricks, machines or parts. It must make its renegotiation refunds in actual money. Where is it going to get the money? The answer to this question is apparently of no concern to the Price Adjustment Boards. In one case, that of a small company which did a total volume of \$750,000 in 1942, the Price Adjustment Board stated flatly that the Board did not care in the least whether the profits of the company were frozen or whether any of them remained in cash.

Effect Upon Machine Tool Builders

The machine tool builder appears before a Price Adjustment Board with four critical problems which remain unsolved:

1. Because of his large increase in volume by comparison to the prewar tax-base years, he is subject to an excess profits tax higher than that of many other manufacturers. (The machine tool builders are not alone in this. Excess profits taxes bear heavily upon many other production equipment industries.)

(Turn to page 76, please)



Cutaway of Littelfuse Extractor Post No. 1075, for 3 AG fuses, showing construction including welded side terminal—gives better electrical conductivity.

LITTELFUSE Extractor Posts

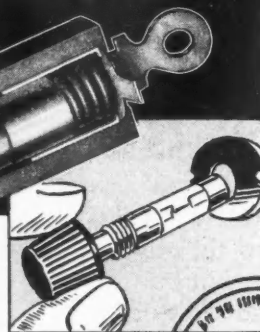
NOW Littelfuse adds welded side terminals to other exclusive factors for complete fuse extractor post service and protection: Pull-knob with specially designed grip, preventing fuse from dropping out; fuse grip permitting full visual shock-proof inspection; spring activated cup insuring positive continuous electrical contact.

WELDED TERMINAL PROOF AGAINST HEAT AND VIBRATION

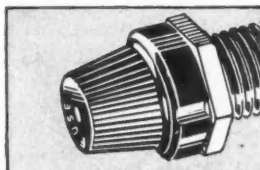
Side Terminals are mechanically connected by electric welding to inside metal shell. Terminal and Shell are made in effect one-piece—proof against heat and severest vibration.

MAXIMUM STRENGTH AND DURABILITY, AS WELL AS ELECTRICAL CONDUCTIVITY AND BETTER PERFORMANCE ARE ACHIEVED.

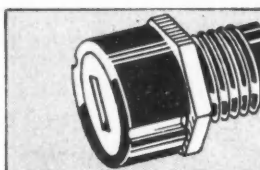
Test samples available. Write



Fuse can't fall out.



Littelfuse Extractor Post 1075-F Finger-knob-operated.



Littelfuse Extractor Post 1075-S. Screwdriver-operated meeting Underwriters' specifications.

Used with 3 AG fuses (1/4" dia. x 1 1/2" long) to 15 amps. For radios, auto-radios, amplifiers, fractional h.p. motors, magnets, control circuits, relays, rectifiers, plate circuits, etc.

LITTELFUSE Incorporated

260 Ong St., El Monte, California

4757 Ravenswood Ave., Chicago 40, Ill.

How Strong is Plexiglas?

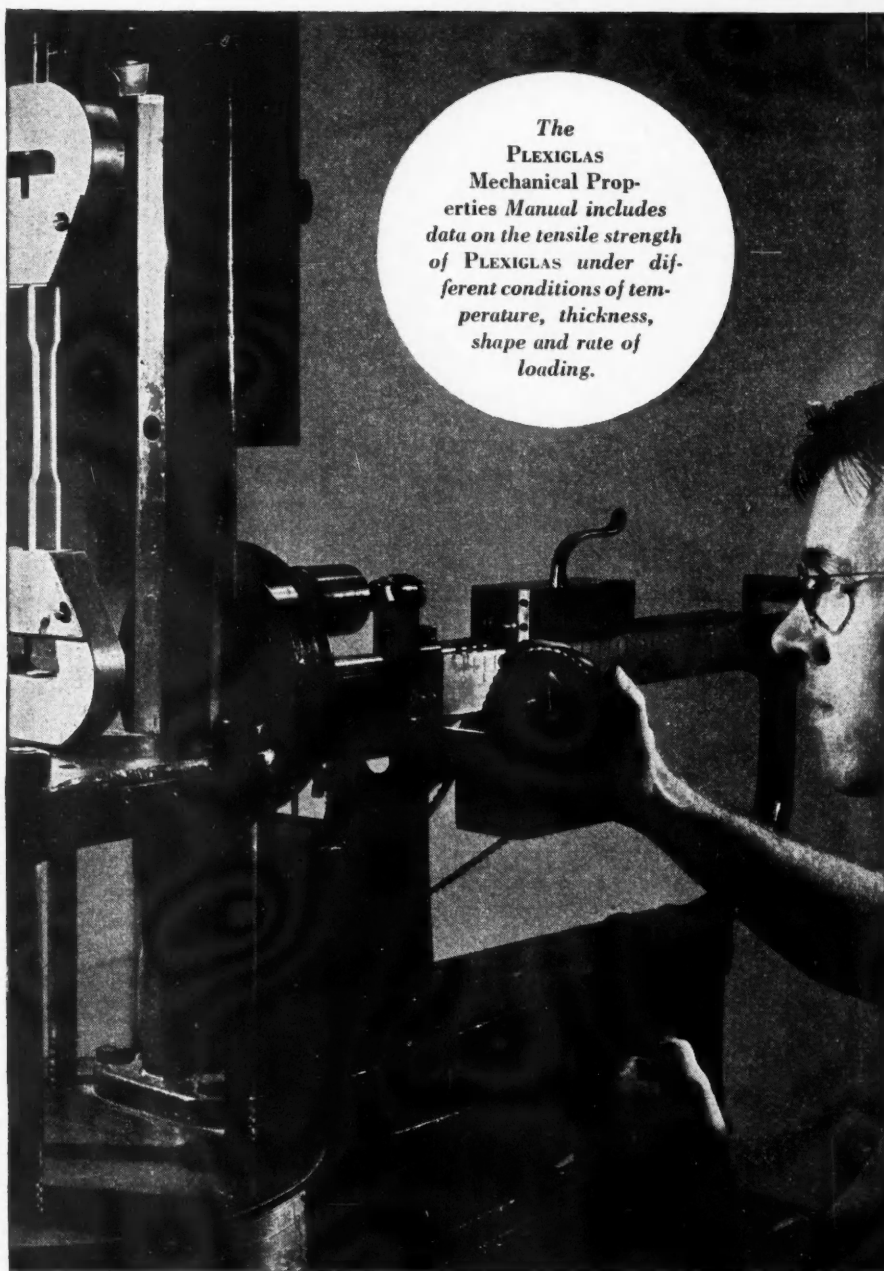
THE answer to this and many other engineering questions can be found in the PLEXIGLAS *Mechanical Properties* booklet. This new Rohm & Haas publication gives the results of scores of tests on PLEXIGLAS conducted recently in our new physics laboratory. Illustrated with numerous graphs and new photographs, PLEXIGLAS *Mechanical Properties* is probably the most comprehensive technical handbook ever published on any plastic.

Write to our Philadelphia office for your copy of this important book.

★ ★ ★

Rohm & Haas Company, Washington Square, Philadelphia, Pa. Other offices in: South Gate, Los Angeles—Detroit—Chicago. Canadian Distributor—Hobbs-Glass Ltd., Montreal, Canada.

THE CRYSTAL-CLEAR
ACRYLIC PLASTICS
PLEXIGLAS
SHEETS AND RODS
★
CRYSTALITE
MOLDING POWDER



The
PLEXIGLAS
Mechanical Prop-
erties Manual includes
data on the tensile strength
of PLEXIGLAS under dif-
ferent conditions of tem-
perature, thickness,
shape and rate of
loading.

PLEXIGLAS and CRYSTALITE are the trade-marks, Reg. U. S. Pat. Off., for the acrylic resin thermoplastics manufactured by the Rohm & Haas Company.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA, PA.

Manufacturers of Chemicals including Plastics . . . Synthetic Insecticides . . . Fungicides . . . Enzymes . . . Chemicals for the Leather, Textile and other Industries



RELEASE MORE INFORMATION ON HUNTER HEATERS

Manufacturer Responding to Rapidly Growing Interest In Units That Burn Any Type of Gasoline

DESCRIBES "SEALED IN STEEL" FLAME

CLEVELAND, OHIO—As a result of the widespread interest aroused by the first generally distributed information on the Hunter Heater, Cleveland headquarters of Hunter and Company has rushed reprints of its product bulletin and has a new edition ready for distribution.

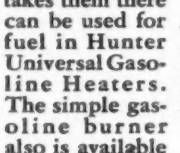


The information is of particular interest to any manufacturer, buyer or user of mobile photo laboratories, field hospitals, truck or trailer mounted field service shops, trucks, trailers or busses, shelters for radar, radio or other delicate equipment or stores to be protected from cold or dampness. The Hunter Heater, time tested in efficient burning of any kind of gasoline from truck fuel to 100 octane, is ideal for heating or ventilating such equipment.



These units are also suitable for heating and ventilating tents, portable houses, field or permanent barracks for officers, and similar housing. Certain models can be used for standby heating of truck or plane engines to assure starting in severe weather, and for cabin heating in buses and aircraft.

Wherever personnel or equipment goes, the same type of gasoline that takes them there can be used for fuel in Hunter Universal Gasoline Heaters. The simple gasoline burner also is available in an automatic water heating tank that is ideal for trailers or mobile service units.



The information bulletin, available on request, briefly describes the standard models, the basic principle of the burner and the general purposes for which they are suitable. It is called "Bulletin HA-2".



Full information, or a consultation with a representative, may be had by writing or wiring Hunter and Company, 1552 E. 17th St., Cleveland, Ohio.

(Advertisement)

(Continued from page 74)

2. Now that Defense Plant Corporation business is included under war contracts, the percentage of business which will be construed by the Boards as subject to renegotiation will be higher than for a manufacturer in most other industries.

3. He has sold out his market for the next 10 to 15 years—whereas many other manufacturers, especially those in consumer goods fields, are looking forward to an enormous postwar demand for their products.

4. Competition of war built machines in the new machine market already has begun. Machine tools built for the production of war materiel even now are being converted to production of peacetime goods. Examples may be cited of machines used less than a year on war work, and now turned to the production of peacetime equipment.

Including Defense Plant Corporation

contracts, very few machine tool companies have completed renegotiation. Judging from the demands thus far made by the Boards the industry is convinced that unless some change occurs in procedure or in the law, they will not be permitted to retain sufficient earnings to enable them to set up the postwar reserves required by the peculiar circumstances of their business. To the machine tool builder the present situation means that the very companies who are most in need of building up postwar reserves are those who will have the least chance to do so. Following the last World War when taxes were nowhere nearly as heavy as they are today and renegotiation was unknown, many machine tool companies went out of business. If no remedy is forthcoming the extent to which today's machine tool companies may be able to weather the postwar storms is problematical.

Human Engineering

(Continued from page 19)

sions were eliminated one by one over a period of months until finally they were back at the point of exactly the same conditions that had prevailed at the time they initiated the tests.

Many might think that this withdrawal of concessions would naturally have resulted in a corresponding decrease in the output, but if I remember correctly both from what I have read and heard, the output at the finish of the experiment, when they were back to the point at which they had started, was higher than at any time in the entire three or four years testing period. Much was proved as a result of this experiment, but today I am primarily interested in the fact that in giving employees a chance to express themselves, a distinct improvement in production was brought about both when granting and withdrawing privileges. Through the interviewing and counseling, these employees were made to feel that they were not mere cogs in a machine, forgotten men, but rather were people whose opinions were valuable, whose ideas were worth seeking, and who were for the time being considered as a part of management, of value in the making of decisions.

That specific tests, of course, is a long way from the counseling which is being developed in many organizations today, but all counseling does or should include the opportunity for every employee to express himself freely. A good counseling system should have such top management endorsement, if not invitation, that there would be no handicap in the way of the employee getting to the counselor through a misunderstanding on the part of the supervisory force. This does occur at times, but as the latter are beginning to realize the benefits accruing from a more understanding and alert person-

nel, they are gradually withdrawing the restrictions with which they have been tempted to harness this effort.

In sound practice any employee should be able to see his counselor. Of course, it would not be good organization for employees simply just to drop their tools and walk off the job on the pretext that they were going to the counselor, but they should be able to clear promptly through the supervisor, and at this point it is well to remember that the proper kind of a supervisor on being approached with such a request would immediately offer his services in the solution of the difficulty. Many problems have been settled at this point and, frankly, there is no more desirable point for them to be settled.

To maintain a productive counseling system, it is essential that the counselor himself occupy a rather self-effacing position. He must be a good listener and this in itself is not an easy task, but sympathetic, understanding listening is vital to successful counseling for, after all, isn't employee counseling the sober second thought in employee relations? Many of the problems coming to the counseling force today are solved by just good tactful listening, and that is not difficult to understand. At some time or other, many of us have been weighted down by some burden that has seemed almost too much to bear and when the pressure became too great, or the convenient opportunity presented itself, have shared that burden with a friend. Now, at such a time we are not particularly analytical in our selection of that friend. We do not stop to weigh his previous experience along similar lines, or his ability to hand down wisdom with all his decisions, but we are sure of one thing—we have found a sympathetic understanding that ap-

pealed to us tremendously at the moment and we proceeded to unburden. We felt better, didn't we? Not, as a rule, for what the friend actually contributed, but probably much more from the fact that for the first time since our trouble began we had made a sequential, logical and honest presentation of the entire facts of the case, with the result that we ourselves saw it in a different light—perhaps we even found the solution.

This is what happens on many occasions in counselling, and there are many experiences on record where the counselor has been personally thanked and has had letters of appreciation for his valuable assistance when as a matter of fact he actually did nothing more than patiently wait until the man had talked himself into the solution.

Of course, all cases are not all like that. Many of them relate to problems of operation that require the subsequent handling to be of a delicate nature. In problems pertaining directly to operations, the counselor has no authority to make decisions, to promise anything, or to take any action. His sole responsibility is to be a neutral channel for the receiving of the essential facts which may be transmitted to the supervisor for whatever action is in the best interests of all concerned. Employee counselling is helping the individual worker to genuine betterment, first by a friendly and sympathetic understanding of his or her problem and then, as an impartial intermediary, by assembling and formulating facts so that a harmonious and satisfactory adjustment may be made by proper agencies.

While the counselor makes no promises to the employee, he can and should freely express an opinion in the subsequent discussion with the supervisor, but any action necessary as a result of the follow-up of the problem is taken by the supervisor, never by the counselor. This upholding of supervision must be maintained at all costs, and is productive of increased respect and consequently higher morale. Most supervisors are anxious to adjust misunderstandings, misinterpretations or sometimes outright mistakes existing in their department, and there are very few instances on record where subsequent embarrassment to the employee has resulted.

Most of the problems, probably to the extent of 70 per cent, pertain to the actual work at hand and the balance are of a personal nature only indirectly applying to the work; those of a domestic nature, of an over-extended budget, sickness in the family, delinquent children, and many other types of worries in which the counselor is able to help in one way or another even, as previously said, just by listening. The personal problem is of a strictly confidential nature and the only results apparent to the supervisory force are the improved attitude of the employee in his application to the work at hand.

IF YOU BUILD BUY-COMMAND

any such equipment as mobile field service shops, photographic or mapping trailers, hospital stations, radar or radio shelters, trucks, trailers or buses.. If you have any application for gasoline fired portable or permanent heating, ventilating or water heating installations, it will pay you to find out about

HUNTER HEATERS

"SEALED IN STEEL"

Flame



Burns ANY
Type of GASOLINE

BULLETIN HB-3

ON REQUEST

HUNTER AND COMPANY

Aircraft Equipment

15 52 E. 17th St.

CLEVELAND • OHIO

Although counseling in the organization with which I am associated has only been in operation for a few months, the employees are availing themselves of it more and more every day and the results are increasingly satisfactory. One of the most gratifying developments has been the attitude of the supervisory force in reaching out for counseling for themselves, feeling the need constantly for a greater understanding in the handling of the many problems that come up in the every day operation in the plant. Fortunately, the counselors are able to render tangible help in this connection and the result has been a noticeable increase in the unfoldment of leader-

ship qualities, and we all know how necessary that is today when so much of our junior supervisory force has been brought up to the positions of responsibility and authority without the experience and training so essential for their own good. Leadership in its fullest sense is an expression of intelligence embracing the welfare of all. It cannot, if it is to be permanent, be partisan or selfish. Its actuating principle must be public service and it must guide others in paths of mutual helpfulness.

Our counselors are mostly men, but one woman counselor is maintained on each shift for the women employees. This may seem strange in view of the

fact that in one of our plants we have over 50 per cent women employees, but in a recent check all women employees were asked whether they would prefer to talk to a man or a woman and there was an overwhelming predominance in favor of the man counselor. The woman counselor on each shift is available for problems of such an intimate nature as could not be taken up with a man.

The greatest limitations to the problem of successful counseling lie in securing the proper type of personnel, because it involves quite a retiring type of individual. The most successful counselors, from our limited experience, seem to be men over fifty who have had businesses of their own and directed group activities. It does require a type of personality that is patient, sympathetic and understanding—one that likes people. It calls for the elimination of personality and emphasizes the principles and practices of sound employee relations. The results of successful counseling should never be realized through the individual, but through the principle it practices and the results it achieves. It is most often developed on an individual basis, but this individual development does sometimes demonstrate the need for collective action.

All new employees are inducted into the organization through the counseling system at which time they are fully advised of its scope, and the service it makes available, and a cordial invitation is extended to all to avail themselves of it should the need arise. This gets us instantly on a better footing with these people, people who are coming into industry for the first time, and to a large extent, people that never anticipated being in the industrial world, many of them actuated by motives of the highest patriotism and all real people.

In the aircraft plants, just as in other war industries, we have had a stupendous personnel problem due both to our great expansion and to the need for replacing men required in the armed forces. We are training and absorbing in our ranks many thousands of women, men beyond the age of military service, young men below the minimum age for the armed forces, and some physically handicapped people whose disability allows them to do some form of productive work and in no way endangers them or their fellow workers. This constant stream of new men and women, most of whom have never previously set foot in an aircraft plant, involves numerous and unavoidable problems. Few of them are difficult, virtually all can be and are solved.

I call the Counselor a "Human Engineer" because he works with hearts and minds instead of charts and data. His tools are sympathy and understanding, instead of the slide rule or rivet gun. But when historians write the story of America's march to victory and lasting peace, the Employee Counselor will be among those who have served their country well.



*This
way*

TO BETTER TOMORROWS

By building better for war, American Industry is learning how to build still better for peace. Out of mammoth production of efficient engines and tools of destruction, will come new safety and comfort, new conveniences and economy for secure and happy living . . . Aetna's own experience is typical. We have made Precision Bearings by the millions—for implements of war. Out of intense ceaseless effort to build better and faster, have come new techniques and methods, new short-cuts and savings.

We have built not only bigger bearings, but better ones. We've applied them to new uses. We've found how to make them efficiently, faster and at a lower cost. . . . How these new and better ways can be practically applied to your



own pleasant peace-time activities is a subject we'll enjoy exploring with you—when you are ready. Aetna Ball Bearing Manufacturing Company, 4600 Schubert Avenue, Chicago, Ill.

In Detroit: SAM T. KELLER, 7310 Woodward Avenue, Phone Madison 8840-1-2.

Aetna

THRUST (STANDARD AND SPECIAL)
ROLLER BEARINGS (SPECIAL) BALL BEARINGS

BALL BEARINGS

AND ANGULAR CONTACT BALL BEARINGS
HARDENED AND GROUND WASHERS



Back of the Big Push to VICTORY

—you'll find the steady "Pull" of Borg & Beck Clutches delivering the men, munitions and materials for our fighting forces . . . *all over the world.*

*For
THAT VITAL SPOT
where
POWER TAKES HOLD
OF THE LOAD!*

BORG & BECK

The Standard Clutch in Peace or War!



BORG & BECK DIVISION

BORG-WARNER CORPORATION

CHICAGO, ILLINOIS

New Production Equipment

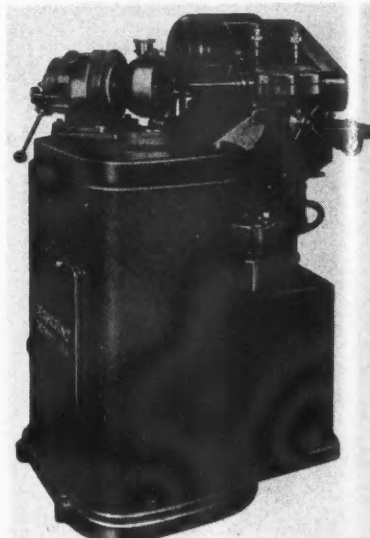
(Continued from page 42)

balance condition in the crankshaft. Fixture aligning latches are provided to hold the two work fixtures in alignment during loading and unloading.

A shoulder grinding attachment is supplied for the rapid removal of as much metal as may be required from the crankshaft cheeks. A bed mounted work rest supports the work being ground. Both shoes of the work rest are brought into operative position, or dropped to inoperative position, by means of a quick acting lever.

The hydraulic straight infeed mechanism is the same basic design as has been used in connection with other Landis equipment. A rapid feed of 12 in. is provided, as it is necessary to feed the wheel back a considerable distance, during work traversal, with some types of airplane engine crankshafts.

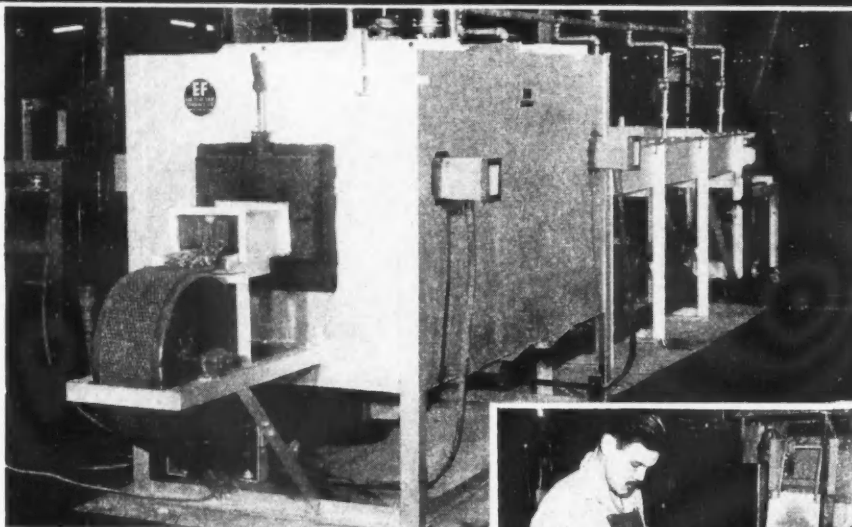
THIS special Geargrind Machine was designed and built by the Gear Grinding Machine Co., Detroit, Mich., for grinding the ball grooves in the



Type JG5 Geargrind Groove Grinder

EF FURNACES

For Every Industrial Heat Treating Process



This EF Copper Brazing Furnace Is Making Stronger and Neater Joints 60 to 75% Faster and Cheaper

"Greatly improved results—neater, stronger joints—60 to 75% faster, at about one quarter the former labor cost," that briefly is the report received from the production manager of a prominent midwestern plant after installing the above EF continuous copper brazing furnace for joining some of their steel assemblies.

Within a month after this furnace was installed, a second similar but larger EF furnace was ordered for joining other products—both furnaces are now in operation, joining all kinds of assemblies—large and small—neatly, economically and securely.

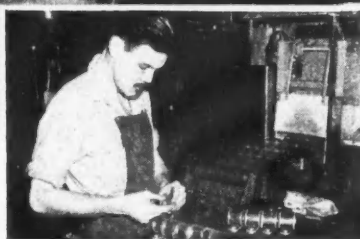
Products difficult or expensive to make in one piece can be made in several pieces and joined—thus not only reducing the cost but actually improving the quality and appearance. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in your shop. Strong, leak-proof joints are made and the completed unit is discharged from the furnace—clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are made to actually "grow together," and joints made which are as strong, or even stronger than the original parts.

Send for printed matter showing various types of EF copper brazing furnaces.

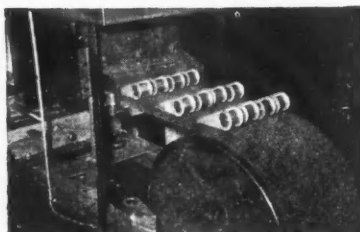
Investigate the Copper Brazing Process for Joining YOUR Metal Parts

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production



The operator assembles the parts and places them on the furnace conveyors.



The assemblies are discharged at the other end...all units securely and neatly joined.

Investigate the brazing process for your products. With slight changes in design you may be able to join your metal assemblies neater, cheaper and stronger by this method.

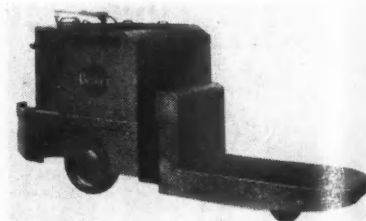
outer housing of the Rzeppa constant velocity universal joint.

The work oscillates on a swinging head, controlled by an automatic magnetic brake, permitting the formed wheel to grind the radii for the ball groove in a curve. The formed grinding wheel is fed in from the front, the rapid traverse of the table being governed by means of an air cylinder. The spacing of the grooves is controlled by an accurate index head.

Ball grooves in the various sizes of Rzeppa joints range from 11/16 in. to 1 13/16 in. and this machine accommodates them all.

TYPE E-3 is the designation of a new 6000 lb capacity low-lift truck, announced by The Baker-Raulang Company, Cleveland, Ohio. All units are totally enclosed and controls are conveniently grouped. The steering operates on all four wheels and is actuated by a horizontal tiller handle.

The truck is designed for operation in intersecting aisles 69 in. wide, has an overall length of 123 3/4 in., an over-

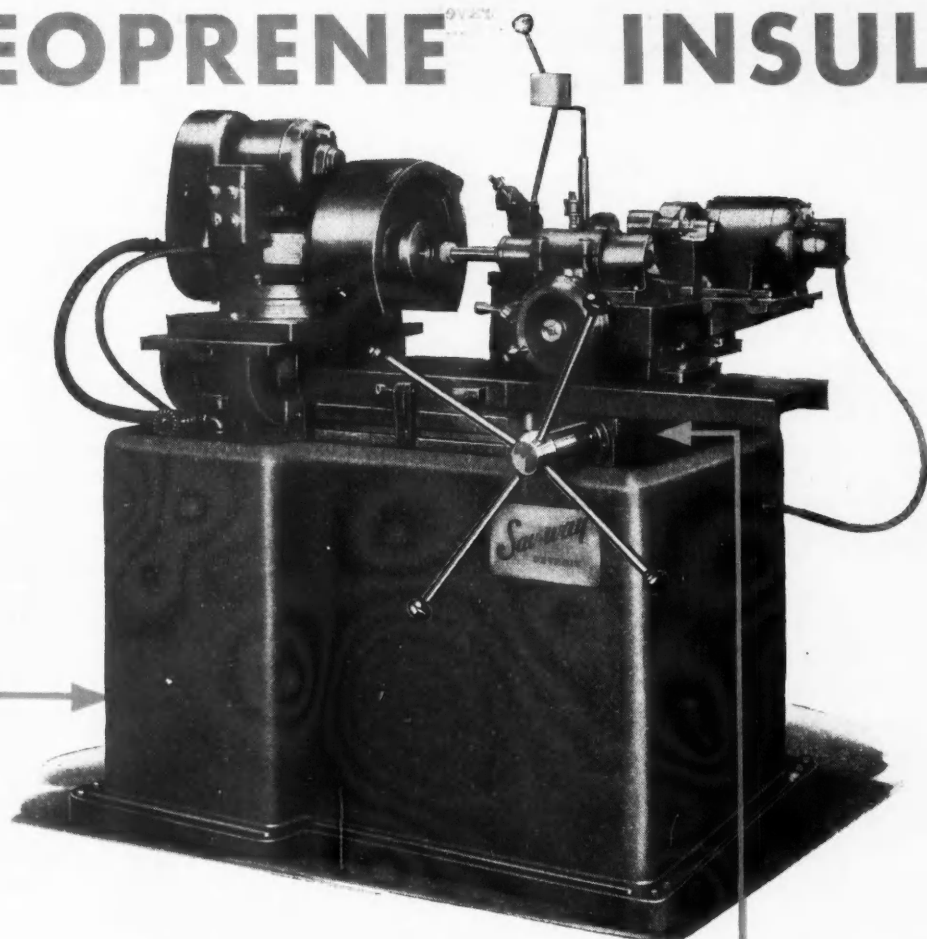


Baker Type E-3 6000 lb. capacity low-lift truck

all width of 42 3/4 in. and an overall height of 55 in. The platform is 26 1/2 in. wide, 54 in. long, and 11 in. high in the low position, and has a vertical lift of 6 in.

The power compartment of the truck has been increased in size to 32 in. by 39 1/2 in. to provide room for additional battery capacity, and the truck without

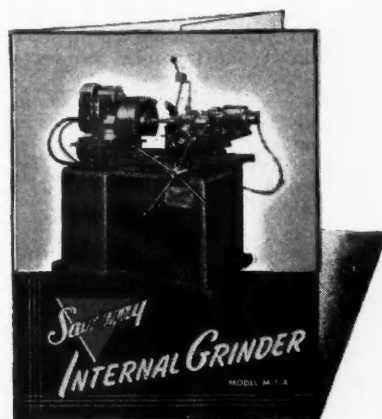
NEOPRENE INSULATED



against Vibration, Distortion, Misalignment!

This radical departure from conventional design gives the Sav-Way multi-purpose internal grinder a new permanence of alignment and resulting higher accuracy. The bed proper is a thick surface-plate type normalized alloy iron casting of heavily ribbed whale-back construction. Neoprene pads between the bed and the steel base eliminate metal-to-metal contact and absorb floor vibration, preventing distortion of the base being transmitted to the bed, which is accurately scraped. This is only one of seventeen specific features which make the new Sav-Way M-1-A Grinder outstanding in design and construction.

For complete description and specifications, attach the coupon to your letterhead.



**Send the Coupon
for Your Copy**

KEEP AN EYE ON

Sav-Way INDUSTRIES
★ Machine Tool Division ★
 4875 EAST EIGHT MILE • DETROIT, MICHIGAN

SAV-WAY INDUSTRIES, 4875 E. 8-Mile Road
 Detroit, Michigan

Kindly send me a copy of the illustrated folder
 describing the Sav-Way M-1-A Internal Grinder.

Name

Position

Firm

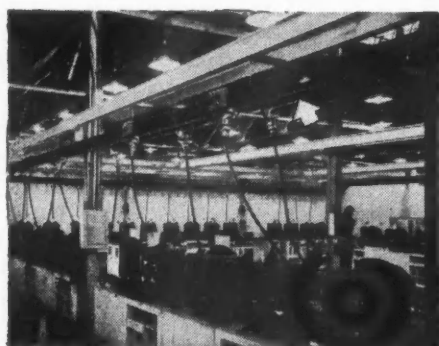
Address

City State

PRODUCERS OF SAV-WAY HAND AND HYDRAULIC INTERNAL GRINDERS • SAV-WAY GOLD
 RAL SPINDLES • PLUG GAGES • PRECISION AIRCRAFT AND AUTOMOTIVE PARTS

7 PLUSES

IN NEW LO-X *Ventilated* FEEDER DUCT



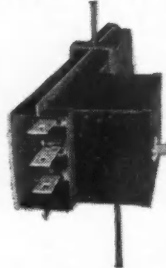
Flexible Light and Power

Built in standard, interchangeable 10-foot sections, Bulldog BUStribution DUCT provides *complete flexibility* on branch power and lighting circuits. The plug-in feature enables you to change production machines at will—rearrange whole departments without interrupting production elsewhere.

BUStribution DUCT is quickly and easily installed—makes sensational savings in maintenance.

Capacities available for Plug-in Type Duct under new WPB standards are 250A, 400A and 600A.

PLUG-IN TYPE for Branch Circuits



(Left) End view of branch circuit plug mounted on a bus duct section—showing how copper "contact fingers" clamp over the busbars in the duct. Plugs are readily interchangeable. Capacities: 30A to 600A; 600 Volts or less.

BULLDOG

ELECTRIC PRODUCTS CO.

DETROIT, MICHIGAN
Bulldog Electric Products of Canada, Ltd.
Toronto, Ontario
Branch Offices in Principal Cities



- + Increased current-carrying capacity
- + Lower operating temperatures
- + Lessened voltage drop
- + Lighter weight
- + Maximum saving in critical materials
- + Improved appearance
- + Easier maintenance and inspection

CONFORMS TO WPB LIMITATION ORDER L-273

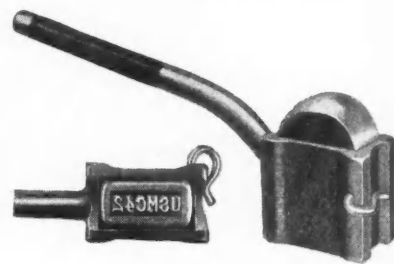
Ventilated type LO-X Duct for Feeder runs also shares all the basic advantages of Bulldog's famous BUStribution DUCT design. It is quickly and easily installed—has full asset value—is 100% salvable. Available in the new WPB ratings of 800A, 1000A, 1350A, 1600A and 2000A. Single-phase, 3-phase, and 3-phase 4-wire; 600 Volts or less.

MANUFACTURERS OF a complete line of
Vacu-Break Safety Switches, Panelboards,
Switchboards, Circuit Master Breakers
and BUStribution SYSTEMS.

power equipment weighs 3700 lb. The truck travels 4½ mph with full load or 6 mph empty on a level floor.

Travel is controlled through the Baker No-Plug Controller, providing 3 speeds forward and reverse. An electric interlock between controller and brake pedal automatically opens the circuit when the brake is set. Circuit can be closed only with brake released and controller in first speed position affording protection against accidental starting. The controller is operated by a lever which extends horizontally to the rear.

AN IMPROVED design Safety Box Type Holder, for marking purposes, is being marketed by the M. E. Cunningham Co. The marking device is said to be universally applicable to operations previously using hand or sledge holders. The holder can be designed for marking round or square pieces either hot or cold. A reinforced outer box, to which handle is welded, levels the holder on the piece being marked and acts as a safety guard by prevent-



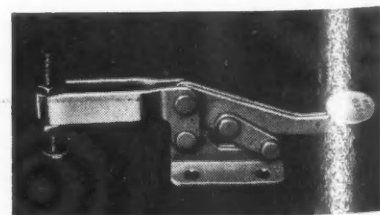
Cunningham Safety Box Type Holder

ing pieces of scale or chips from flying out from under holder.

The steel type holder rides freely inside of the box, but cannot fall out because of special shepherd hook pin which holds it in place. The Holder is reported to be constructed of one-piece Safety Steel to resist spalling and mushrooming, and can be made in numerous sizes and number of characters.

A NEW horizontal type toggle clamp is being made by Knu-Vise, Inc., Detroit, Mich. It is said to be the strongest clamp on the market for its size and weight. Known as model KP 835, it has a U-shaped bar which provides for the horizontal positioning of the pressure spindle and permits the clamping of many different work pieces of varied thicknesses without disturbing the original location of the clamp.

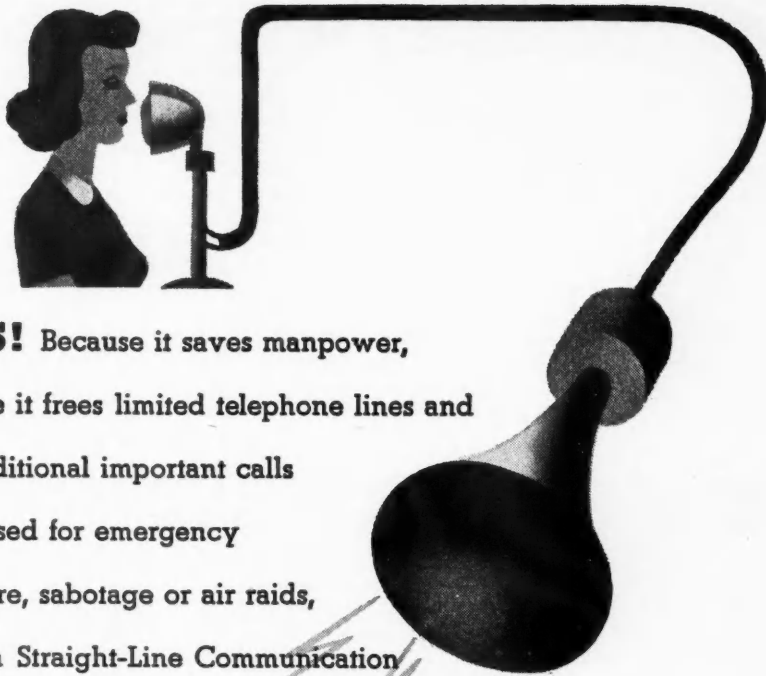
This type of clamp (having both



Model KP 835 Knu-Vise

To help win the war, SAVE metals—SAVE fats—SAVE money, BY BUYING WAR BONDS

SPEEDING PRODUCTION

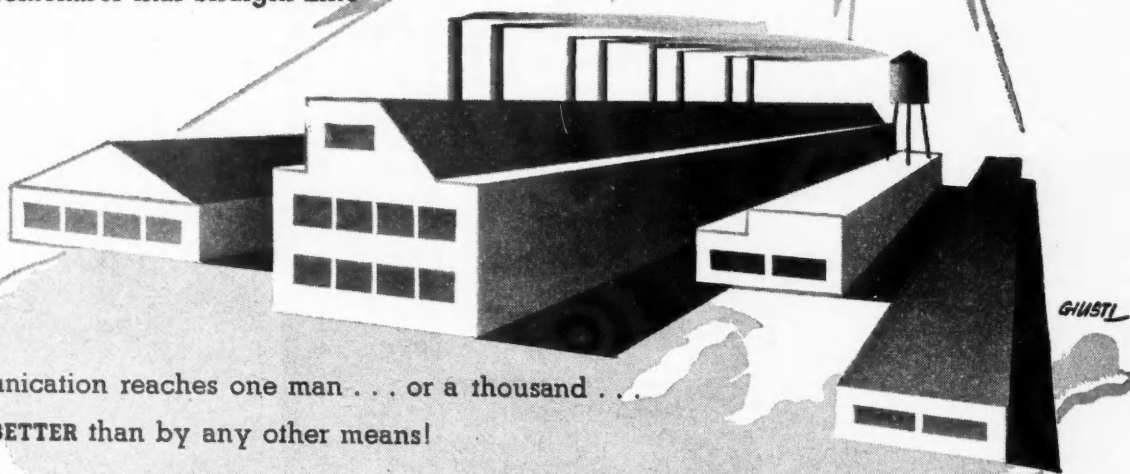


...IN 37 STATES! Because it saves manpower,
time and money . . . because it frees limited telephone lines and
equipment for additional important calls

... because it can be used for emergency
warnings against fire, sabotage or air raids,

Stromberg-Carlson Straight-Line Communication
has become recognized all over the nation as an aid to victory!

When you're thinking of ways to speed production and promote safety
... remember that Straight-Line



Communication reaches one man . . . or a thousand . . .
QUICKER and BETTER than by any other means!

And remember that Stromberg-Carlson equipment is the product
of nearly half a century of experience. Why not get in touch with us now?

Sound Systems Division of the Stromberg-Carlson Company,

100 Carlson Road, Rochester 3, New York.

Write for free Booklet No. 1931.



STROMBERG-CARLSON, ROCHESTER 3, N. Y.



STRAIGHT-LINE COMMUNICATION SAVES MANPOWER • SPEEDS THE WORK TO VICTORY

October 1, 1943

When writing to advertisers please mention **AUTOMOTIVE and AVIATION INDUSTRIES**

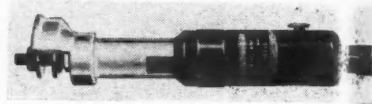
toggle bar and handle in horizontal position when clamp is closed) proves most efficient on table-height operations. The worker can assume a natural position to manipulate the handle, and there is usually ample room above the clamp to allow free swing of bar.

The clamp measures 6 inches in length when closed. It is cold rolled, cyanide hardened, and cadmium plated. The spindle (with Neoprene pressure pad to protect smooth finished surfaces against mars) has an adjustment angle of 1 1/4 in. horizontally within the channel of the U-bar. The clamping action of the handle will multiple to a pressure of 550 lbs. at the pressure contact.

DESIGNED for use in foundry work and other applications where tools receive rough handling and are subject to abuse, two new portable pneumatic tools with malleable motor housings and malleable throttle heads are now being announced by The Aro Equipment Corporation, Bryan, Ohio.

These new portable production grinders have 2 in. wheel capacity, weigh approximately four pounds, and have a speed range (through an adjustable speed control) of 15,000 to 18,000 rpm. Model 221 has a button throttle control and Model 321 a lever throttle.

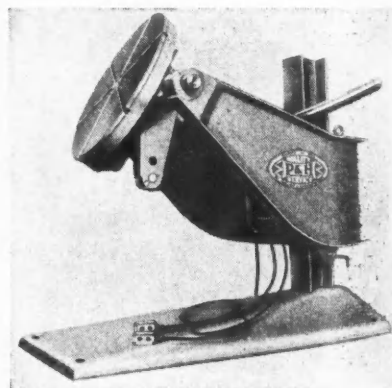
Both models are intended for 2 in. wheel grinding and cleaning on castings but are also said to be excellent



Portable pneumatic tool made by Aro Equipment Corporation

for use with rotary file burrs on aluminum and magnesium. They are available with a variety of adapters, collets and extensions.

HARNISCHFEGER CORPORATION, Milwaukee, Wis., is introducing a newly-designed line of work-positioning machines featuring dual capacity rating of each model. For example, the WP-6, in the 6000 lb class, handles loads up to 6000 lb and also has a secondary capacity of 9000 lb maximum. Standard models are being made in dual capacities up to 24,000 lb maximum. Construction is for constant heavy-duty service, employing all-welded steel throughout, with strong box-type mounting. Table top areas are larger than usual. By placing the elevator column further back, the design provides greater clearance for handling large weldments. Self-locking worm gear and spindle drive on tilting motion prevent upsets, with limit switch and adjustable stop bracket.



P & H Model WP-6 Welding Positioner

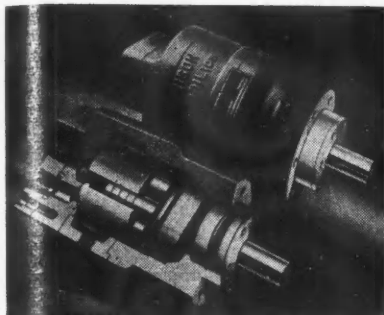
ets giving additional safety when extreme tilting is necessary.

The table can be quickly removed for bolting special weldments or fixtures direct to the bull gear. Control of table motions is by remote control with individual magnetic push-button stations to two separate motors for tilting and turning. All models are supplied for a-c or d-c and may be had with portable or in-the-floor mountings.

THE Denison Engineering Company, Columbus, Ohio, has just placed on the market the Denison Hydraulic Fluid Motor. It is an axial piston type fluid motor having no mechanical linkages or universal-type drive rods. The driving and driven elements are directly connected and in constant contact. Within the recommended speed ranges, there are no limits to the number of

Wyman - Gordon laboratory controlled forgings are in the air today in every high-powered American plane . . . forged by men who work on the principle that our flyers must have nothing but the best.

Wyman-Gordon
 WORCESTER HARVEY, ILLINOIS
 Forgings - Laboratory Controlled
 MASSACHUSETTS
 DETROIT, MICHIGAN

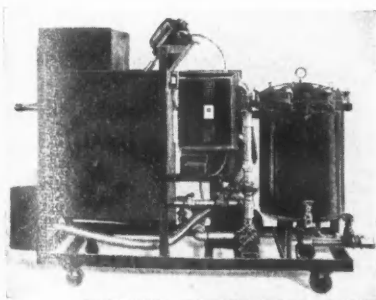


Denison Hydraulic Fluid motor

speeds at which these Fluid Motors can be operated.

The horsepower output of Hydroilic Fluid Motors is said to be directly proportional to their revolutions per minute, with a given constant operating pressure on the fluid. Actual running torque is estimated at 95 per cent of theoretical torque, and stalled torque is 85 per cent of running torque. Floating drive provides high shock protection to the motor. Instant starts, stops, and reversals can be made with complete safety to the motor. Because of the axial-piston design, there is no dead center position from which manual help will be required in starting. All working parts of the motor operate in a constant bath of the oil used to power it, making external lubrication unnecessary.

AN oil treating unit for filtering and reconditioning oils at temperatures between 170 deg F and 200 deg F has been brought out by the Sparkler Mfg. Company, Mundelein, Ill. The equipment consists of a 100-gal mixing and heating tank that is equipped with electric immersion heaters, a mechanical agitator, a thermometer, a filter aid storage box of 50 lb capacity, a main line fused knife switch, a magnetic push button controller, a Sparkler Model 18-D-12 horizontal plate 600 gal per hour filter, a rotary pressure



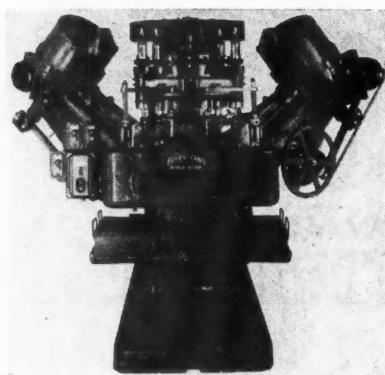
Sparkler Model 18-D-12 Oil Treating Unit

pump, and a 1-hp motor. The pump is so arranged that it can be used as a transfer pump to pump the oil from the pump into the heating and mixing tank, and also to pump the oil through the filter. The tank will heat 100 gal of oil from 80 deg to 180 deg F in 30 min.

It is claimed by the manufacturers that sulphinated oils, lard oils, lubricating oils and many other oils can be restored to their original efficiency and sterilized with this equipment. The machine is mounted on ball bearing casters, and 2 lengths of neoprene hose are supplied.

THE Bodine Corporation of Bridgeport, Conn., has designed a fully automatic nut tapping machine which delivers four nuts simultaneously to four tapping stations by means of two hopper feeding mechanisms, each equipped with two adjustable chutes. Four nuts are produced per stroke, each nut being discharged to its individual collecting box so that the product of each tapping spindle may be individually gaged prior to its delivery to stock.

If desired, two sizes of nuts can be run simultaneously. Each spindle carries

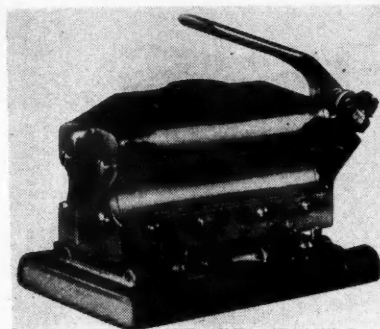


Bodine automatic nut tapping machine.

its own compensator which allows the tap to follow its own lead. Spindle drive is through a train of gears.

There are two sizes of standard machines—one handling nuts up to and including 1/4 in.-28, the other to 1/2 in.-20. Both machines may be factory-adapted to include countersinking and tapping; or drilling, counterboring and tapping, by addition of a suitable automatic indexing dial. Thus a multiplicity of operations can be performed on a single blank. When components are feedable by hopper, a battery of machines can be tended by one operator. Production depends upon the size of the nut and material from which it is made. A number 10/32 nut, for instance, of X1335 steel can be tapped at the rate of 160 per minute on the smaller machine.

THE Sundstrand Sander, manufactured by Sundstrand Machine Tool Company, Rockford, Ill., is now available in a light-weight, hi-speed Model 1000. This machine weighs less than 6 lb, has a speed of 3500 oscillations per minute, can be equipped with different



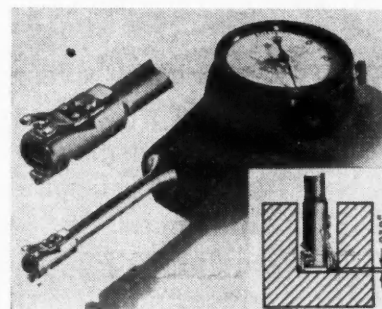
Sundstrand Model 1000 Sander

types of sandpaper attachments for large or small, wide or narrow, flat or curved abrading surfaces on metal, wood, plastics, or composition.

Operation of the machine is obtained with pad movements started and controlled by a palm lever fitted at top of the machine housing. When machine is gripped to operate, the reciprocating action of pads starts. Upon release, the machine automatically stops.

Opposed pad action and balance of moving parts eliminate vibration.

FEDERAL PRODUCTS CORPORATION, Providence, R. I., has brought out a new blind hole gage of the centralizing type. The gage is designed to check inside diameters to within 0.030 in. of the bottom of blind holes. Internal operating friction, lost motion, and wear are said to have been practically eliminated as all parts in the gaging head are spring-suspended. There are no bushings or bearings. These features also permit the gage to be used under adverse conditions, as a reasonable amount of oil, coolant, or dirt in the gaging head does not affect the accuracy or sensitivity of the gage. Two auxiliary locating contacts centralize the measuring contacts diametrically across the center of the hole. A slight



Federal Blind Hole Gage

rocking motion is required to locate the contacts at right angles to the walls of the hole in all positions except at the bottom of the hole. The gage measures diameters directly, and can be set to a master gage, gage block, or micrometer.

That Extra Bond—Did You Get It?

MEN

Tuthill Pump Co. has announced the following changes in the administrative organization of the company. H. T. Kessler, formerly vice president, has been made executive vice-president and general manager. W. D. Caldwell, controller, becomes assistant treasurer, retaining the duties of controller and Jess Tharp has been appointed works manager.

R. W. Morrison, manager of the Industrial Pneumatic Tool Div. of the Aro Equipment Corp., has been appointed by the War Production Board as a member of the Portable Pneumatic Tool Industry Advisory Committee.

The Lincoln Electric Co. has announced

the appointment of William J. Cobley, former chairman of the engineering dept. of the University of Rochester, as consulting engineer. He will act as a Lincoln welding consultant for various industries, handling problems on mechanical and structural design utilizing welding.

Charles Schuler has returned to Edison-Splittorf Corp., after a leave of absence of several months on a special assignment at Packard Motor Car Co. He will be district manager of the spark plug div. in the East Central territory.

W. S. Rockwell Co., New York City, announce the election of the following officers. C. D. Barnhart, Chairman of the board of directors; C. B. Kentnor, Jr., President; J. A. Doyle, vice president; H. J. N. Voltman, secretary and G. A. Yagle, treasurer.

George M. Gillen, who has been in charge of advertising and sales promotion for Lukens Steel Co. and subsidiaries since

1935, has been appointed assistant manager of combined sales.

William L. Schrader, production assistant to vice president, R. G. Kellett, of the Kellett Aircraft Corp., has been made general factory manager. Mr. Schrader will continue his duties as assistant to the executive vice president and will be responsible for production control, plant engineering, etc.

Denison Engineering Co. has announced the affiliation of R. C. Griffith with its organization. Mr. Griffith will serve as manager of engineering and research and will collaborate with the company's marketing division.

H. H. Friend, formerly associated with Scintilla Magneto Div., Bendix Aviation Corp., is now development engineer of electronics, airplane division dept., Curtiss-Wright Corp., Bloomfield, N. J.

L. B. Ragsdale, formerly research engineer in charge of engineering on PT Boat engines at Sterling Engine Co., has been made manager of the airplane division department in the newly formed development division of Curtiss-Wright Corp.

Cyrus Ching has resigned as an industry member of the National War Labor Board to return to his position as vice president of United States Rubber Co.

Glen L. Logan, formerly assistant to the general sales manager of Packard Motor Car Co., has been appointed assistant sales manager of Graham-Paige Motors Corp.

A. N. Morton, production manager of factories in Plainfield and New Brunswick, N. J., and Allentown, Pa., has been elected vice president in charge of factories and a director of Mack Mfg. Corp., succeeding C. T. Ruhf, who recently was elected president. C. W. Haseltine, secretary-treasurer, also has been elected a vice president.

John P. Moran, formerly president and general manager, has been elected board chairman of Gemmer Mfg. Co., Detroit, succeeding the late E. P. Hammond. Frederick M. Hammond, formerly vice president and assistant general manager and a son of E. P. Hammond, has been named president and general manager to succeed Moran.

Charles W. Pickens has been appointed traffic manager of the Oldsmobile Division of General Motors, succeeding the late D. C. Whitmore. A. S. Corwin has been named assistant traffic manager.

James L. Bancroft, president of the Ohio Body Co. until its liquidation in 1928 and president and organizer of the Great Lakes Mfg. Corp. and the Hydromatic Products Corp., Cleveland, has been named commercial research director of Interstate Aircraft & Engineering Corp.

Ahlberg Bearing Co., Chicago, has appointed M. G. McGregor to take charge of replacement sales. He was formerly manager of the company's Cincinnati branch and has been with Ahlberg since 1925.

Incentive Pay Methods Re-emphasized by GM

(Continued from page 48)

ment in 2458 war plants in Michigan, Ohio and Kentucky increased about 33 per cent to 2,520,590 but employment of women in those plants was up 150 per cent to 669,860, of 27 per cent of the July total. Due to selective service, the number of men in Detroit war plants actually has declined in the last 10 months, the influx of women workers accounting for aggregate increases in employment. In the 60 days ending July 1, Detroit plants had a net loss of 2000 men and gained 16,000 women for a net gain of 14,000 employees.

40,000 Influential Men Read

AUTOMOTIVE and Aviation INDUSTRIES

- 5,040 are Administrative Executives.
- 15,290 are Engineers.
- 8,525 are Production Men.
- 4,060 are Sales Executives.
- 3,485 are Purchasing Executives.
- 2,325 are Service Executives.
- 1,348 are Miscellaneous

(Libraries, associations, etc.)

Practically every reader of AUTOMOTIVE and Aviation INDUSTRIES — including many of those in the "Miscellaneous" classification — either buys or influences the buying of products and equipment used in the plants of the two great industries this publication serves, in war and in peace.

That constitutes an audience worthy of your careful consideration.

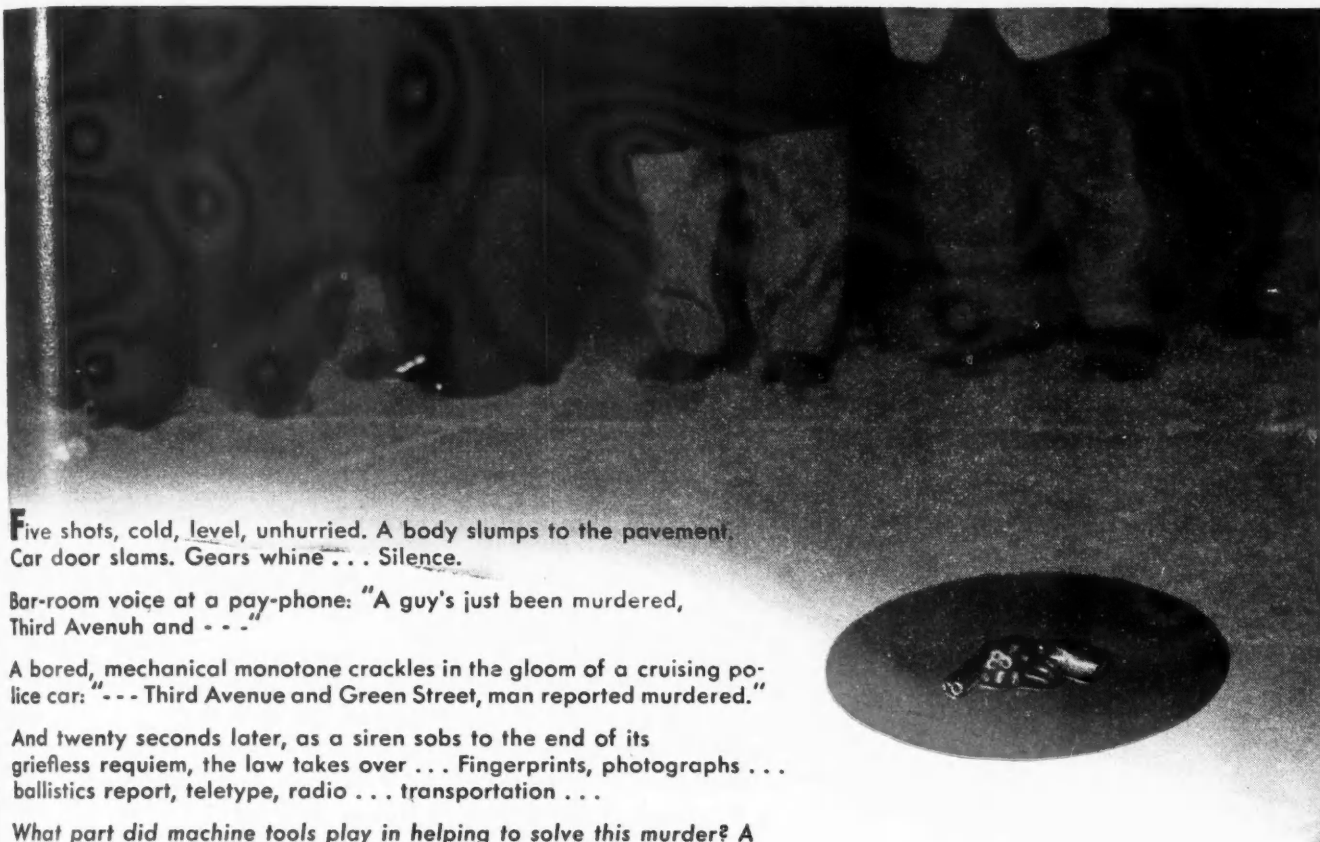
AUTOMOTIVE and Aviation INDUSTRIES

A CHILTON Publication

Chestnut and 56th Sts.



Philadelphia 39, Pa.



Five shots, cold, level, unhurried. A body slumps to the pavement.
Car door slams. Gears whine . . . Silence.

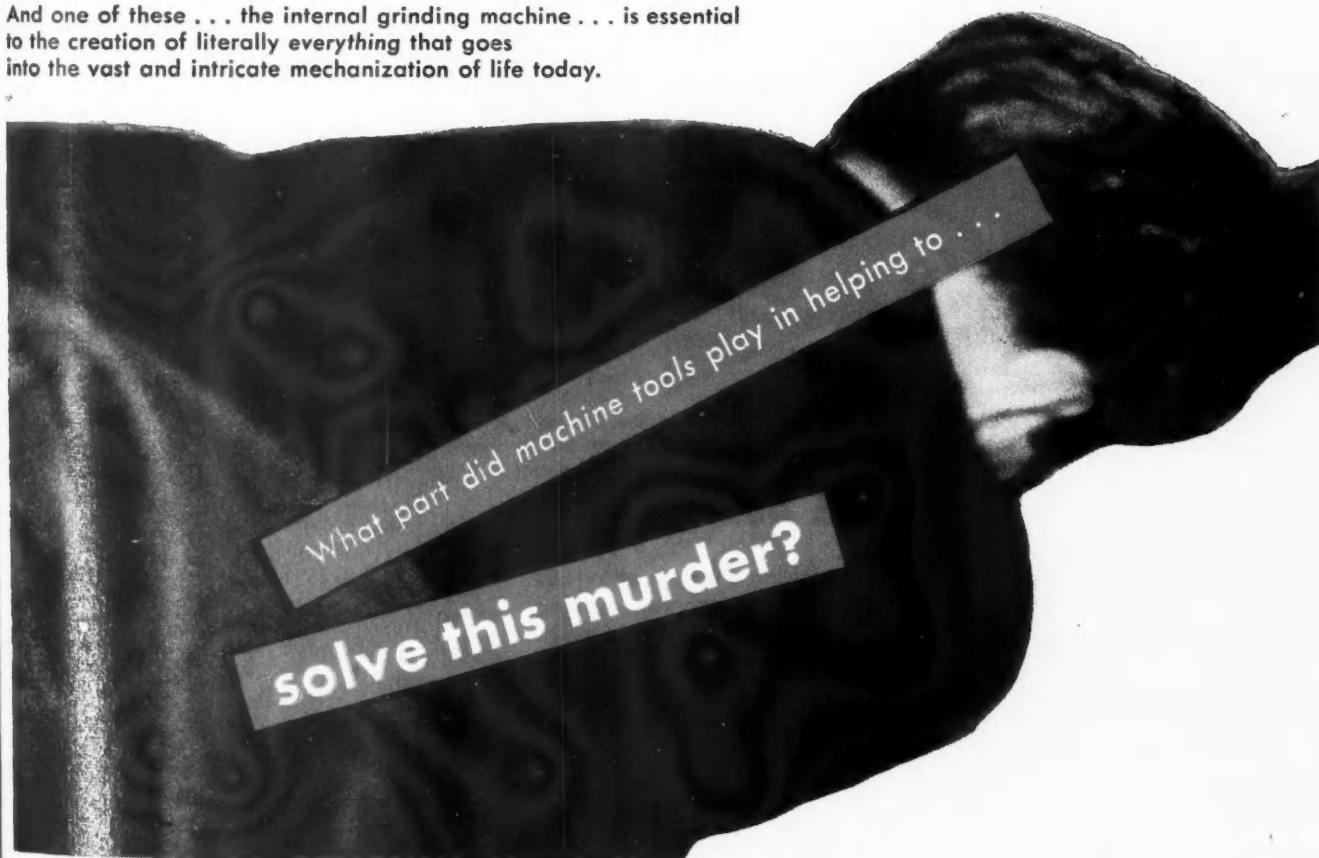
Bar-room voice at a pay-phone: "A guy's just been murdered,
Third Avenue and - - -"

A bored, mechanical monotone crackles in the gloom of a cruising police car: " - - - Third Avenue and Green Street, man reported murdered."

And twenty seconds later, as a siren sobs to the end of its griefless requiem, the law takes over . . . Fingerprints, photographs . . . ballistics report, teletype, radio . . . transportation . . .

What part did machine tools play in helping to solve this murder? A very great part. For all this integrated mechanism of law and order and justice was made possible by a relatively few basic precision machine tools.

And one of these . . . the internal grinding machine . . . is essential to the creation of literally everything that goes into the vast and intricate mechanization of life today.



BRYANT CHUCKING GRINDER CO. **SPRINGFIELD VERMONT, U.S.A.**

October 1, 1943

When writing to advertisers please mention **AUTOMOTIVE and AVIATION INDUSTRIES**

89

Castings Poured in Conveyor

(Continued from page 38)

of waste that accrues daily. Sand is subject to rigid laboratory control to assure standard conditions. It is checked every two hours for permeability, moisture content, physical properties, and inhibitor strength.

Those familiar with airplane engine parts can appreciate the complexity of the dry sand core structure. Of the eight castings made here, two require 29 different cores each. The rear crankcase, in particular, marks a special Chevrolet innovation of which the man-

agement is justly proud. This mold is made without a drag. Instead, the 29 cores are assembled on a drag plate fitted with drag pins for the alignment of the cope. This unit is delivered to the molding line where the previously prepared cope is fitted ready for pouring.

Chevrolet has learned from its current experience with magnesium that perfection of intricately-cored castings depends upon specialized techniques of core making, with cleanness of surface

and freedom from surface defects being of paramount importance. Each core piece is carefully made, thoroughly cleaned and surfaced, and carefully gaged to assure precise alignment in the mold. Another technique contributing to soundness of castings is the adoption of a method of pouring through sand filters instead of metal strainers.

Tracing the process beginning with the continuous molding conveyor, it is found that the molds continue on the conveyor until they reach the shake-out station where they are broken up on special vibrating grates. Following this, the cores are knocked out on a specially-designed vibrating machine, developed here. This is an air-operated machine, enclosed in a sound booth to reduce noise and keep dust out of the department. The castings then are thoroughly cleaned by processing in an American Tablast sand blasting machine.

Following sand blasting, the gates and risers are cut off on band saws, the operating being performed with the use of special fixtures which enable one operator to do the job quickly and effectively. Castings then are acid-dipped, water-rinsed, and dipped in a dichromate solution to bring out any surface imperfections which otherwise could not be seen.

Next the risers are removed completely by end-milling on some special heavy-duty drill presses converted for this purpose. Each machine is fitted with a pivoted table permitting the operator to remove the heavy riser in one cut by moving the table, by hand, under the cutter, then progressively indexing the work until all risers have been removed.

The work then proceeds to the cleaning room where operators perform the various jobs of burring and grinding to remove fins, parting lines, seams, etc., using pneumatic tools. This work is done in Roto-Clone booths in which the fine dust and chips are sucked into the sump, carried away in a heavy stream of water to prevent fire hazard.

The castings are inspected visually and then thoroughly checked for wall thickness, using a variety of Federal micrometer gages fitted with oftentimes intricately formed jaws capable of reaching otherwise inaccessible sections.

After all of the machining operations have been completed, the castings are acid-dipped, water-rinsed, and dipped in dichromate solution.

Following inspection, the castings are given a solution heat treatment and aging treatment; heat treatment is handled in long horizontal Ross System ovens of continuous type in which the work is held at 730 F for 22 hours. The Ross equipment is being supplemented with large General Electric vertical type furnaces to take care of increasing volume. Aging treatment is given in ovens where the work is held at 350 F for 12 hours.

All castings that have oil passages or

**The Handiest
TOOL EVER
PUT IN A
SHOP!**

BUY U. S.
WAR BONDS

Sold WITH BLANK COLLET JAWS

Eliminates need for designing special fixtures or purchasing special collets.

THE NEW WAYNE Collet Chucking Fixture provides a most convenient and universally useful means for holding stock in machine operations. It is unique because sold with blank, soft steel jaws which you can drill to your exact specifications right on the machine to be used, and harden if necessary for longer runs. Blank jaws may be kept in the bin ready for new uses. Write for bulletin and details today.



THE WAYNE PUMP COMPANY, Fort Wayne 4, Ind.

Wayne Collet

**CHUCKING
FIXTURE**



That shocking and pitiable thing is a piece of shirt. . . . The man who wore it is gone.

Whose fault? The machine's? The man's? Neither! He was the victim of a monstrous and nameless killer loosely known as Carelessness. That accident was the result of a conspiracy of "harmless" circumstances. He had his sleeves rolled up. He leaned down to reach for a tool. He turned. The gears bit into the roll of his sleeve.

Ghastly? Sure. That's why we speak of it. For last year there were more than 5,000 industrial accidents every day in this country. Nearly 20,000 men were killed at their jobs last year, in the battle we lost with Carelessness.

Yet, this killer can be cornered; and has been in scores of plants. Aroused by our tragic losses in men and manpower, the National Safety Council is directing a major counterattack against the accident menace. In support of that program, we offer the following Safety Quiz for executives and production men as a check on conditions in your own plant. For detailed

information on accident prevention, your government urges you to call upon the National Safety Council.

Are there any unrailed grease pits, unguarded gears, exposed belt drives, or unprotected saws and other cutting tools in the plant?

Is there improper lighting and unsafe visual contrast between moving and stationary parts of machines? (Accidents were reduced 75% in one plant by painting non-operating parts white, leaving working parts in their natural metallic lustre.)

Are traveling cranes, straddle trucks and similar moving machines skirted and fendered, brightly painted (yellow is best) and equipped with alarm horns?

Is there any guard against loose material on scaffoldings, and crews working one beneath another?

Are workers' garments checked for loose sleeves, dangling neckties, rings; women workers' hair and heels; correct use of helmets, goggles, safety visors, etc.?

Are new workmen properly instructed about all hazards they may encounter?



JONES & LAMSON

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.
Profit-producing Machine Tools



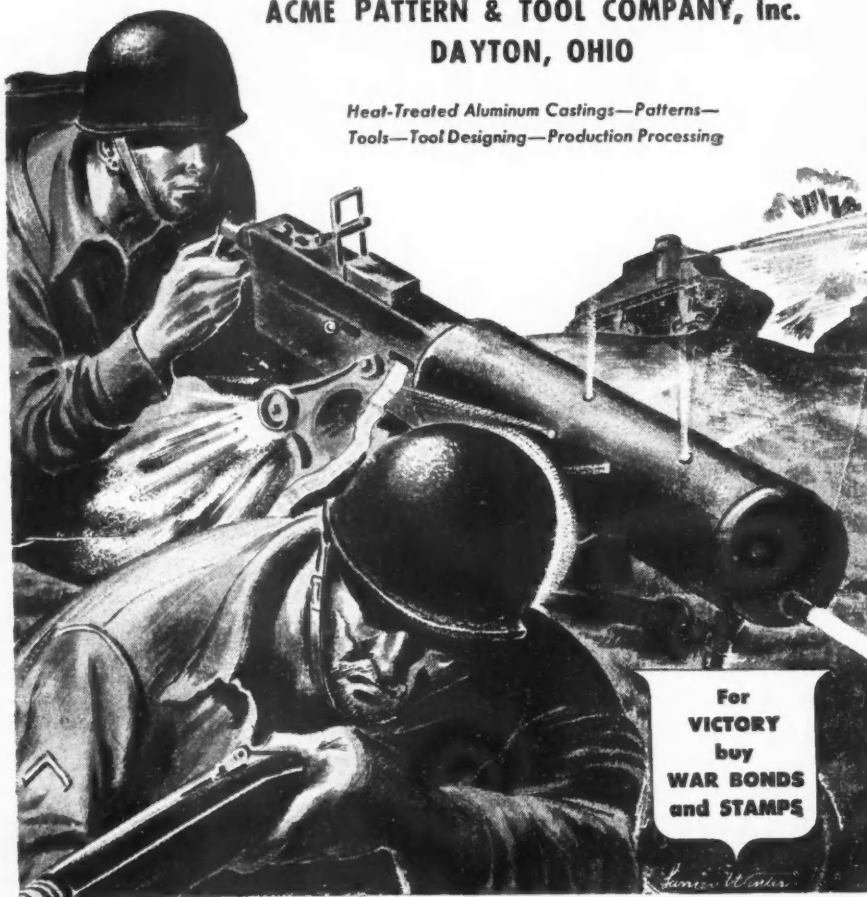
Today's war of movement goes into even faster action as the 'round-the-clock allied air attacks soften up enemy-prepared positions, blast supply lines and wreck armament plants.

Here at Acme, we're also in action—24 hours a day. Every previous record in producing tools, patterns, and heat-treated aluminum castings has been broken. And new records have a very short life. For the faster we work, the more we help war production plants to deliver fighting tools on time.

An experienced staff of engineers is a vital part of the Acme organization. Why not let us see if we can help you eliminate any bottlenecks that may be lessening production in your plant?

ACME PATTERN & TOOL COMPANY, Inc. DAYTON, OHIO

Heat-Treated Aluminum Castings—Patterns—
Tools—Tool Designing—Production Processing



require oil-tightness are pressure tested to assure tightness and must hold specified pressure before they can be approved for shipment.

Final inspection, before shipment, is done on benches using massive gaging fixtures with movable pins and reference plugs, enabling the operators to check every important point according to the established tolerances.

Core making is a basic operation in this plant. Wherever possible, cores are made on semi-automatic molding machines. However, the many slender and intricately formed core pieces still are made by hand. Unique feature of such hand operations is the development of "filler" plates which have been carefully machined so as to properly apportion the amount of sand required to fill the small mold.

Chevrolet stresses the point that cores must be soft, employing the minimum of wires essential to good support of slender pieces. Surface hardness is obtained by spraying the cores.

After the cores have been drawn they are carefully smoothed and cleaned to remove loose particles and to prevent the formation of surface indentations in the casting due to fins or parting lines in the core. All cores are carefully gaged after baking.

Interesting feature of the core room is the assembly line for the drag plate, mentioned earlier. This is done on a long bench having six assembly stations. The 29 cores required for the assembly are set in place progressively, each stage being carefully gaged.

All modern foundry operations are based upon scientific laboratory control. But such procedures have particular importance when dealing with magnesium. It is, therefore, not surprising to find that Chevrolet has established a new and completely equipped laboratory, featuring General Electric X-ray equipment, an Arl-Dietert spectrograph, and a mechanical testing lab with Riehle tensile testing equipment. Among its other responsibilities, the laboratory serves as a watch-dog on the melting room, analyzes and makes physical tests on specimens taken from every heat. No heat can be approved for pouring before it has been cleared by the lab.

One significant detail of magnesium foundry practice, differentiating it from the handling of other metals, is the fact that high porosity and shrinkage coupled with the specialized practice of gating and risering requires the melting and pouring of about 300 per cent excess metal. With grey iron the excess is only about 25 per cent. This makes it necessary to employ special methods of salvage to reclaim the greatest percentage of waste and chips.

Finally it is well worth noting that even with the expanding magnesium project, Chevrolet is continuing its grey iron foundry operation under the same roof, currently averaging about 300 tons per day. Its peacetime output averaged 2100 tons daily.

See Your Own BAR STOCK and TUBING

(FERROUS and NON-FERROUS)

Tested

at the NATIONAL METAL SHOW

Palmer House, Chicago, Room 844—Oct. 18 thru 22

We suggest that you bring samples within the following size limitations: Outside Diameter, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{4}$, $\frac{1}{8}$ or 1"; Length, 4 to 6'

Sperry's **ELECTRIC FLAW DETECTOR**

SPERRY PRODUCTS, INC.



HOBOKEN, NEW JERSEY

Wide Variety of Rubber Mountings

(Continued from page 24)

stock which is stored in water tanks to prevent sticking, is sliced into lengths of specified size, washed, and coated with special cement. Then the pieces of tubing and calendered stock are routed to assembly benches where the metal and rubber assemblies are made up and racked in preparation for molding. Recently the tempo of the assembly operation was greatly accelerated by the introduction of a mechanized setup in which two long benches are served by individual fabric endless con-

veyor belts for rapid transportation of finished parts.

Another feature is what is termed a "small order" department. This is in reality a small replica of an assembly group, self-contained so as not to interfere with the production assembly department. Here are produced a variety of short runs, experimental batches, and special orders, required for emergency.

The molding department is self-contained, provided with large batteries

of presses for tubular, disc and flat molded parts. Each press is controlled as to temperature. Operation of the molding department is controlled by a laboratory which is set up to check a specified percentage of vulcanized parts from each heat. Among its functions are the checking of the rubber to metal bond, strength of the rubber, spring rate, etc.

Following molding, the bonded rubber parts are transported to the adjacent cleaning department where the parts are first stripped and cleaned of flash, then machine polished on special equipment featuring adaptation of Delta heads. An interesting item of equipment here is a horizontal Hammond belt type polishing machine used for polishing cylindrical rubber parts. Another department in this group is devoted to the burring and polishing of metal parts of the assembly.

The entire rubber department is isolated and air-conditioned to provide the proper atmospheric conditions for the handling of precision rubber compounding, assembly, and molding operations. The rubber department also is served by a comprehensive tool room whose principal function is the production of molds. This same tool room provides jigs and fixtures for use with the metal-cutting machine tools.

This perspective of an unusual type of manufacturing setup is supplemented by a pictorial section to provide the reader with a good visualization of the activity in various sections of the plant.

GLOBE HYDRAULIC HOISTS SPEED PLANE HANDLING


for Manufacture, Modification and Servicing

Where Globe Hydraulic Airplane Hoists are in service—in assembly hangers, modification centers or service shops—the free wheeling of a large bomber or transport plane is only a matter of minutes. Installation and servicing of landing gear mechanism and tires is made easier and quicker.

With Globe Hoists spotted under the two wing jacking pads and the tail (or nose) pad, a plane can also be raised easily to actual "flight position" for accurate checking and

calibrating of instruments, armour and controls.

Many leading plane manufacturers and airline operators have found the answer to their particular plane-handling requirements in the wide choice of types available in the Globe line. One of the most popular and versatile is the Type A-70 Portable Hoist illustrated in use below. For a folder on all types of Globe Airplane Hoists and the new Globe Airplane Wheel Dolly, write Globe Hoist Co., Mermaid Lane at Queen Street, Philadelphia 18, Penna.



TYPE A-70

- Compression-spring-mounted wheels make Hoist portable... permit entire base to engage floor under load.
- Max. lifting capacity, 21,000 lbs.
- Hand screw adjustment . 30"
- Power lift 27 3/8"
- Maximum height 111"
- Approximate weight, 1750 lbs.
- Power: Electric or gasoline motor

GLOBE

GLOBE HOIST COMPANY
Philadelphia, Pa. Des Moines, Ia.

HYDRAULIC AIRPLANE HOISTS

Cyclewelding

(Continued from page 25)

and riveted metal to metal joints. According to test data released by the Army Air Forces at Wright Field for publication, the ultimate sheer strength of the Cyclewelded joint was almost twice that of the riveted joint. Impact strength was many times greater. Creep strength was 50 per cent greater. Some experiments were made comparing riveted and Cyclewelded wood-to-metal joints. The Cyclewelded joints were much stronger and lighter.

Not only are Cyclewelded parts said to be better than those produced by conventional methods, but they are far less costly to make. On one part alone Chrysler has found that it can save 90 per cent in cost as compared with riveting, in addition to a saving of manufacturing time.

The development of Cyclewelding goes back to 1938 when Chrysler began using a special cement to bond interior insulation material to automobile roofs. By 1940 the cement was improved to permit cyclewelded bonds holding together passenger car parts, such as panes of glass, trunk covers, cowlings ventilators and parts of fenders. Early in 1941 Chrysler engineers began experimental work with Army aeronautical engineers at Wright Field with the idea of applying the Cyclewelding technique to aircraft manufacture.

HOW ABOUT A POSY FOR THOSE BEHIND THE SCENES?



THE MAGNIFICENT performance of the star rates the plaudits of the audience. But shouldn't there be spared from the star's bouquet a flower for those behind the scenes whose efforts have helped to make the performance such a triumph?

America's gigantic war effort is the most spectacular production of all time. Its drama is breathtaking. Its cast of characters huge. Some of the actors must remain in the background... but their performance is none the less essential.

We here at Joyce have been destined to play that kind of role. You won't find our name in the headlines. We'll be unmentioned in thrilling stories of naval

and military victories. But we're gratified to know that we've been able to help bring about those victories. For the products of Joyce artisans can be found in battle on land and sea, in the air and under the sea—indispensable parts of our fighting forces' weapons and equipment—parts whose dependability and precision functioning are vital.

Joyce is proud of the justly deserved honors awarded American Industry, for the parts, assemblies and machines built by Joyce engineers and craftsmen are helping many of the nation's greatest war-production plants to attain and maintain new production records.

If you find it difficult to meet your war contracts, let Joyce's specialized production skill show you the way. And, when Victory comes, that same Joyce "know how" will be immediately available to assist you in licking postwar production problems. A Joyce representative will be glad to call and explain the unique advantages we are equipped to offer.

★ *More Bonds over here mean more Bombs over there* ★

JOYCE
Machine Company

2000 WHEATSHEAF LANE • PHILADELPHIA

★
MANUFACTURERS OF PRECISION PARTS
FOR ALL KEY INDUSTRIES

BEHIND THE MAN ▶ BEHIND THE MAN ▶ BEHIND THE GUN

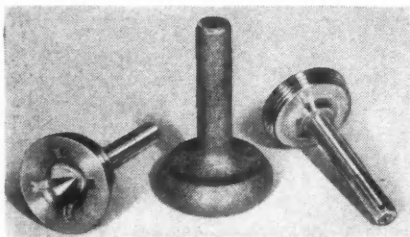
October 1, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

175

PRECISION PARTS

BOLTS FOR DRIVING THE ENEMY NUTS



An airplane depends on this.

These fine precision-machined pieces ride the skies all over the world. They are only a small part of Uncle Sam's swift-moving ships of the air—but a vital part. They are machined at Ace from rough forgings to highly accurate finished pieces. The grinding of the threads, as well as the turning and grinding of the various diameters, must be held to exceptionally close tolerances . . . and, if you look closely, you'll see an .060" diameter hole drilled through the thickness of the head.

The ability to do highly accurate machining and grinding . . . and to do it on a mass production basis . . . is an accomplishment this war has taught us. Today, when you need small parts or assemblies come to Ace, and we will try to fit them in with our present production. Here you'll find not only the modern precision machinery, but the skill, the background, and the ingenuity to use those machines to get the required results.



The Ace story on precision work will interest you. Send for a copy.



ACE MANUFACTURING CORPORATION
for Precision Parts



1241 E. ERIE AVE., PHILADELPHIA 24, PA.

Tank Production Program Reduced

(Continued from page 46)

planes, 349,000 airplane engines, 53,000 tanks, 1,233,000 military trucks and 9,500,000 small arms, rifles, carbines and machine guns.

In his biennial report to Secretary of War Stimson for the period ending last June 30, General George C. Marshall, chief of staff, stated that 2400 tanks were shipped to Russia up to that time. Other lend-lease shipments to the Soviet Union included over 3000 airplanes, 80,000 trucks, 16,000 jeeps, 7000 motorcycles and 109,000 sub-machine guns.

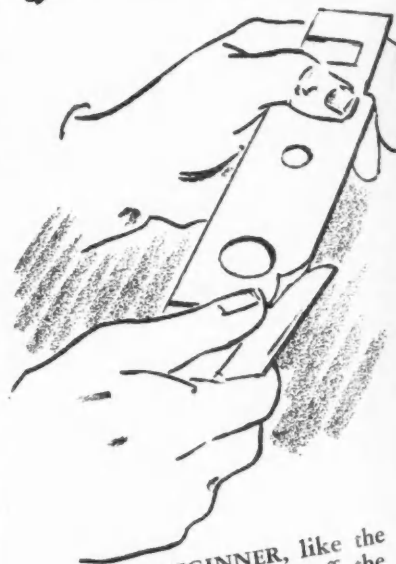
The Army Air Forces revealed some revision in the super-bomber B-29 manufacturing program when it announced that in addition to manufacturing major assemblies for this plane, the Fisher Cleveland Aircraft Division would undertake a contract for a new type of fighter plane. With this shift, the final assembly of the super-bombers will be transferred from Cleveland to another unnamed plant. It is understood that the fighter plane to be built at Fisher Cleveland Division is one developed by General Motors.

Eastern Aircraft Division of General Motors recently was congratulated by Rear Admiral R. E. Davison, acting chief of the Navy's Bureau of Aeronautics, for producing "many hundreds" of warplanes in the last year. The first Grumman Wildcat fighter plane built by Eastern Aircraft flew on Sept. 1, 1942, and the first Grumman Avenger torpedo bomber took the air Nov. 12, 1942. Conversion of five automobile body and battery plants in New Jersey, New York and Maryland had begun Feb. 24, 1942, less than seven months before the first Wildcat came out of the Linden, N. J., plant. The first of six subsequent contract increases was received May 1, 1942, boosting the total contract 130 per cent and calling for peak production within 23 months. Eastern Aircraft has achieved such volume, now producing in a day as many planes as were turned out in a week only a few months ago, that it has relieved Grumman of the job of making Wildcats and Avengers to concentrate on the newer Hellcat fighter.

Buick Motor Division of GM is scheduled to produce more Pratt & Whitney Twin Wasp 1200-hp aircraft engines in the last quarter of 1943 than it made in all of 1942. Production is being accelerated to provide power plants for the four-engine B-24 bombers which are urgently needed in the bombing of Europe. Buick is the major engine source for the Ford Willow Run, Consolidated Fort Worth and Douglas Tulsa plants manufactured B-24 bombers. Buick's fourth quarter output is scheduled to advance 36 per cent over the third quarter and will be three times the volume of the first



**ready-
made
skills
for trainees**



THE BEGINNER, like the veteran, merely peels off the .003 or .002-inch thick laminations to make the required accurate fit . . . A Laminum shim places precision in any man's hands!

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

Laminated Shim Company
Incorporated
51 Union Street • Glenbrook, Conn.

LAMINUM
THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

2038

METAL SPECIALTY

*fulfilling exacting
requirements*

for

INDUSTRY

in

PLASTIC MOLDING

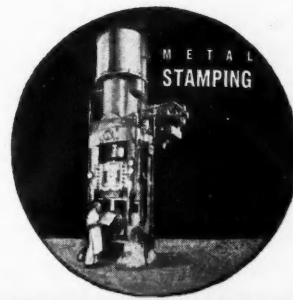
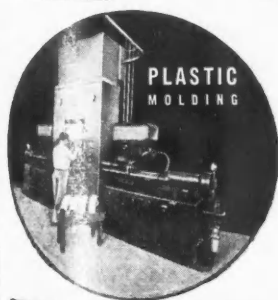
and

METAL WORKING

Drawing • Coining
Rolling • Forming
Stamping • Welding

Metal Specialty's plants are equipped to render you complete service in the fabrication of all Metal Parts, and in Plastic Injection Molding up through 18 ounces per shot. Along with 850-ton self-contained hydraulic presses for Metal Working, Metal Specialty has one of the four 18-36 ounce capacity injection presses for Custom Molding together with full complementary equipment.

Assembled Jobs • Pressed Metal to Order



The
METAL SPECIALTY Co.

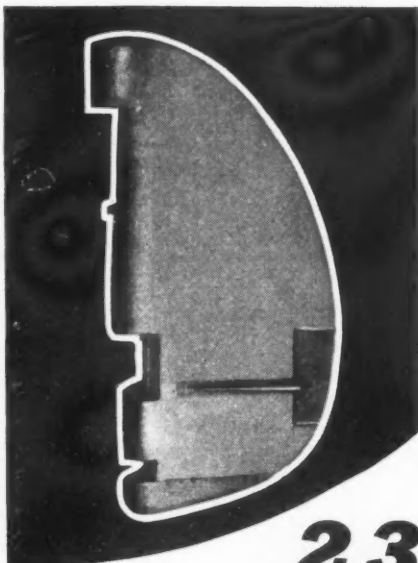
MAIN OFFICE AND PLANT • ESTE AVENUE • CINCINNATI, OHIO



October 1, 1943

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

177



**23
years**

OF EXPERIENCE in fabricating aircraft . . . personnel skilled in working with aluminum, aircraft steels and fabric . . . specialized equipment for forming, assembling, treating and finishing the job completely . . . the capacity to make deliveries on schedule . . . these advantages make Mercury a logical source for aircraft surfaces.

accessories, too

Oil Separators for de-icing equipment, Flier's Relief Tubes and Fittings and Communication Sets for training planes are typical of the many aircraft accessories produced by Mercury in quantities which assure rush shipments.

NAF-47089

We are able to make especially quick delivery on this widely used Navy Oil Separator.

AT *The Cradle of Aviation*



quarter of 1943. Total 1943 output likely will triple that of 1942.

Chevrolet Motor Division of GM, also producing Pratt & Whitney 1200-hp engines, at North Tonawanda, N. Y., recently used some of its expanded test cell facilities to test engines built at the main Pratt & Whitney plant at East Hartford, Conn. It was the first time that engines built at East Hartford had been tested elsewhere. Complete interchangeability of parts in the engines produced by Pratt & Whitney and its five licensees also has enabled the East Hartford plant to supply Chevrolet with parts in which it was experiencing a temporary shortage.

Michigan is the leading war production state of the nation according to latest figures compiled by WPB. Michigan's \$11,469,576,000 in armament orders, 10½ per cent of the national total, place it nearly half a billion dollars ahead of New York, which is second with \$10,981,623,000. California is third with \$10,399,699,000. Seventy-nine per cent of Michigan's war contracts are for tanks, military vehicles, shells, guns and similar ordnance items. Twenty-three per cent are for aircraft and parts and 5 per cent for ship construction. Michigan ranks third in prime aircraft contracts with \$2,593,036,000. California is first with \$6,801,654,000 in aircraft contracts, 65 per cent of the state's total, while New York is second with \$4,146,443,000.

Steel Making Material Again a Problem

(Continued from page 46)

effect a new form of allocation certificates, whereby copper consumers no longer need present such certificates to sellers for endorsement. All that will be required in the future is that the consumer certifies on his order that he has been authorized to purchase copper, stating at the same time his allocation number. This is expected to eliminate considerable paper work all around.

Minor changes in Maximum Price Regulations governing tin have been promulgated, adding a few grades to those previously listed and liberalizing distributors' margins.

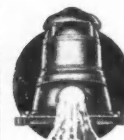
Search for beryllium ore is reported to have been greatly facilitated by a method of determining the beryllium content of the ore, from which it is derived, developed by members of the U. S. Geological Survey staff, members of which are also credited with having worked out short cuts for determining the tungsten content of very low grade ores.

Barnes Opens Eastern Office

The John S. Barnes Corporation of Rockford, Ill., has opened an Eastern sales office at 250 W. 57th St., New York City. The office is under the supervision of Mr. E. C. Hawkins, formerly chief engineer of the LeMaire Tool & Manufacturing Company of Detroit.



THREE FULLY PROVEN FEATURES



The post-war era may be years—or only a few short months away. The tides of battles and Nations are running faster and faster. Peace may fall upon us with a shattering suddenness. In the less hurried days of peace, the buying of machinery and equipment is sure to be upon a more keenly exacting basis. It is then that Layne's three great and fully proven features—Quality, Efficiency and Reliability, will reach new heights of appreciation.

Building Turbine Pumps and Well Water Systems requires skill, patience, knowledge and experience. In all of these attributes, Layne leads the world. That leadership is today, and has long been many times greater than that of any competitor. Such a record cannot be discounted.

Layne Turbine Pumps and Well Water Systems are built with the utmost precision and from the world's finest and most practical materials. They offer the highest in efficiency, longest years of life, lowest upkeep cost and the most reliable service.

For illustrated literature, address Layne & Bowler, Inc. General Offices, Memphis 8, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada.

LAYNE

WELL WATER SYSTEMS DEEP WELL PUMPS

**Builders of Well Water Systems
for every Municipal and Industrial Need**